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ABSTRACT

The report documents second year activities of the Educational Center for Disabled Students serving college students with a broad range of both physical and learning disabilities at the University of Nebraska-Lincoln. Center goals include improving student academic performance and attitudes through the use of computer technology and academic skills training, establishing the Center utilizing appropriate computer equipment and software, and disseminating model project information. Major second year activities were: (1) implementation of Center services and expansion to new students; (2) completion of initial summative outcome evaluation; (3) expansion of dissemination activities; and (4) initial formalization of interventions (technological and adaptive) and assessment procedures and instruments for replication. Major findings of the evaluation included: student grade point average (GPA) increased during the time the Center has operated; incidents of disabled students on academic suspension or probation decreased over the time the Center has operated; a higher percentage of students entering since the Center began are completing 100% of attempted credit hours; and hours of Center use was a significant predictor of semester GPA. Dissemination activities included professional reports and presentations; and outreach activities to schools, parents, and community. Appendixes include planning documents, assessment instruments, suggested intervention strategies, a bibliography of information sources, and an inventory and vendor list. (DB)

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DEMONSTRATION PROJECT

1986 - 1987 FINAL REPORT

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I. PROJECT OVERVIEW

A. Goals and Objectives

The Educational Center for Disabled Students was established at the University of Nebraska-Lincoln in August, 1985 to provide services to students with a broad range of both physical and learning disabilities. The goals of the Center are to:

1. Improve student academic performance and attitudes toward success in college through the use of computer technology and academic skills training.

2. Establish the Educational Center for Disabled Students utilizing appropriate computer equipment and software.

3. Disseminate model project information concerning computer technology and academic training to prospective students, parents, the business community and other postsecondary institutions.

Specific program objectives related to these goals are specified in the Formative Evaluation Plan provided in Appendix A.

First year activities focused on the establishment and organization of the Center and involved the following:

1. Development of an overall evaluation plan for the Center.

2. Identification of the service population and the specific educational needs to be addressed by the Center.

3. Identification and procurement of the physical aspects of the Center, including computers, software and needed adaptive equipment.

4. Identification of academic and skill training materials necessary to supplement and enhance the usability of the physical equipment in the Center.

5. Initiation of project dissemination activities.

Details of these first year activities and first year accomplishments are provided in the 1985 - 1986 Final Report.

As indicated in the 1985-1986 Final Report, the second year has seen a shift in Center activities from establishment of the Center and identification of assessment and intervention strategies to implementation of interventions,

evaluation of Center effectiveness, and dissemination. Major second year activities to date have been:

1. Implementation of Center services in accordance with Center objectives and expansion to new students.

2. Completion of initial summative outcome evaluation.

3. Expansion of dissemination activities.

4. Initial formalization of interventions (technological and adaptive) and assessment procedures and instruments for replication.

This report will summarize second year accomplishments to-date related to the activities indicated above. Activities and outcomes will be cross referenced with the Evaluation Plan (Appendix A). Accomplishments related to Center objectives will be summarized in this section. Section II will discuss the client population changes and environment. Section III will provide evaluation results from the initial outcome evaluation and a summary of formative evaluation activities. Section IV will summarize dissemination activities. Section V will discuss current and planned replication related activities.

B. Accomplishments/Milestones

Program objectives are detailed in the Center Evaluation Plan (Appendix A). Second year accomplishments for the objectives related to each program goal will be detailed in this section. A summary of accomplishments by objective is provided in the Evaluation Plan Progress Report (Appendix B).

Goal 1: Improve Student Academic Performance

Objectives for Goal 1 focus on assessment of student needs, delivery of services and evaluation of student progress. Accomplishments in relation to evaluation objectives for each program objective follow.

Objective 1.1 is to evaluate student needs for technology and skill training. Center intake needs assessments have been conducted for all current student users utilizing the Needs Assessment Instrument and interview (Appendix E). Intake - Attitude Surveys, conducted by the Center's outside evaluation team under the direction of Dr. John Berman, have been completed on all original students and all 1986-87 new students. Second year follow-up surveys have been completed for original students, with follow-up results compiled (see Section III: Evaluation Report).

Objectives 1.2 and 1.3 concern delivery of training in technology and skills training for needs identified. Student

use logs indicated that students spent 415 hours using the Center during November and December, 1986 and 203 hours during the last week in January and all of February, 1987. This indicates that students are heavily utilizing the services and facilities available. Center services are summarized in the Center Intervention Strategies (Appendix I). The primary current use of the Center is for word processing for completing written assignments and tests (66% of logged Center use time). This was expected to be the most heavily utilized aspect of the technology as ability to produce written material is the most immediate benefit that can be derived from computer technology. Few students to-date have needed sophisticated adaptive devices to utilize the equipment available (see details in the 1985-86 Final Report on adaptive issues); however, population demographics indicate an increase in severely disabled students who will have need for the adaptive technology. Large print monitors have been extensively utilized by visually impaired students.

Objective 1.4 concerns progress with use of equipment and software. Students have been able to master basic operation and word processing applications with few problems. Students can become productive with word processing applications within the first hour of training and practice. Visually impaired students have been able to master operation of the large print system with a single training and practice session. The speed of mastery is primarily related to the selection of easy to use equipment and software as detailed in the 1985-86 Final report. Use of other interventions has not been at a high enough frequency to establish trends in training progress. Third year evaluation activities will be directed at establishing more precisely the training needs and time required for training.

Objectives 1.5, 1.6, and 1.7 concern the summative outcome evaluation of the effectiveness of the Center. Results of these evaluation activities are reported in Section III of this report. The initial outcome evaluation and attitude/belief evaluation were completed as scheduled in January and February, 1987.

Goal 2: Establish Educational Center for Disabled Students

Objectives for Goal 2 concern establishment of the physical aspects of the Center, arrangement of referral/ cooperating agreements and evaluation of activities. Second year accomplishments for each objective follow.

Objectives 2.11 and 2.12 relate to the identification of population needs. Individual Intake Needs Assessments have been summarized into a population profile (Appendix J) and are reported in the next section of this report. This profile was updated with information from new 1986-87 students.

Objectives 2.21 and 2.22 concern identification of available equipment and software for establishing the physical aspects of the Center. Assessment activities in this area have resulted in the updating of the Center Bibliography of Information Sources (Appendix K) and the completion of a vendor list for obtaining equipment that is being utilized (Appendix L). Additional assessment activities have involved contact with major manufacturers (IBM and Toshiba), and local dealers to gain information about new developments and product releases. Attendance at the Closing the Gap conference on technology for the disabled was again utilized to observe and test new products presented in vendor displays. New technology that has been identified and implemented involves increasing use of lap-top computers in the classroom. These computers are being used for augmentative speech for non-verbal students and as support for student notetaking.

Objectives 2.31 and 2.32 concern obtaining equipment and software to meet identified needs. Primary acquisition activities were done during the first year and are reported in the 1985-86 Final Report. Second year funding does not allow significant equipment or software purchase. The Center has pursued the obtaining of new equipment though cooperation with vendors and manufacturers. This has resulted in the obtaining of Morse code entry devices for testing and the obtaining of Toshiba notebook computers for testing of portable work stations. In addition contact with current suppliers has resulted in the obtaining of upgrades of previously purchased software.

Objectives 2.41 and 2.42 concern identification of other available services and arrangement of working/cooperating agreements. During the fall, 1986 a survey of available services at the University and other local services was conducted. Existing providers and their services are summarized in Appendix G. The cooperating agreement with the Augmentative Communication Center at the Barkley Memorial Center, University of Nebraska-Lincoln, was continued and strong working relationships were established with State Vocational Rehabilitation and Services for the Visually Impaired for information sharing and services. Work with State Vocational Rehabilitation has resulted in assistance to 5 students to obtain personal computer systems. Also, work with the University Internship Office resulted in the placement of three disabled students in business internships.

Objectives 2.51 and 2.52 are related to evaluation activities. The Center Evaluation Plan was reviewed and updated in October, 1986. The initial summative evaluation was completed in January and February, 1987 (Reported in Section III of this report). Formative evaluation activities were conducted as scheduled to develop the mid-year and final evaluation reports (Section III).

Objective 2.6 concerns additional funding and expansion of the Center. Contact has been made with IBM Corporation and regional representatives of Toshiba Corporation for the purpose of obtaining grants of equipment. With evaluation results now available new proposals will be developed during the remainder of the second year. The Center has moved to new facilities at the University providing more space for student utilization and other internal University staffing and funding plans for continuation of the project beyond the final grant year are in progress.

Goal 3: Disseminate Model Project Information

Objectives for Goal 3 concern dissemination activities for information sharing and replication. Details of these activities are provided in Section IV of this report. Accomplishments for each objective follow.

Objective 3.1 relates to publication of the Center Newsletter Outreach. Second year newsletters have been published in September, 1986, December, 1986, and March 1987 (Appendix M). At the 1987 AHSSPPE Conference, Christy Horn, Center Coordinator, assumed chairmanship of the Special Interest Group for computers for the purpose of formally establishing this group within AHSSPPE as the major vehicle for dissemination of computer related information to post-secondary institutions. As a result of these SIG activities, the Center Newsletter was discontinued and the Center became the editor of the SIG newsletter. When formal SIG status is finalized, the Center will begin publication of this newsletter.

Objective 3.2 concerns compilation of dissemination information and development of dissemination materials. Evaluation data been submitted for formal publication, a manuscript on technological applications has been prepared for submission, and process evaluation information has been incorporated into Center presentation materials. Details are provided in Section IV.

Objective 3.3 concerns providing information to other professionals in education and rehabilitation for the purposes of replication and expanding the general knowledge base in the field. Five second year conference presentations were made during 1987. One second year publication has been completed with work progressing on publications related to assessment, technology uses and evaluation methods and results. Details are provided in Section IV.

Objective 3.4 relates to information sharing with students, parents, school systems, and the community. The Center Newsletter has provided information to school systems and community service agencies concerning Center operation

and have generated significant information requests (Section IV-E). Meetings and consultation with prospective students and their parents have resulted in increased interest in the University and increased enrollment (Section III).

Objective 3.5 concerns dissemination to the business/ employment community. The major accomplishment in this area has been the completion of a program brochure by IBM Corporation for distribution to businesses and other post-secondary schools (Appendix N). Additional dissemination has been done through the sharing of information and referrals with the IBM Educational System Office, Hotline for the Handicapped.

Objective 3.6 deals with the providing of educational/ training opportunities to students in disability related fields though internships. One second year computer science intern has been placed to work on technology adaptations and equipment testing. Three disabled students have been placed in internships in the business community with one obtaining part-time employment resulting from the internship.

Objective 3.7 concerns development and testing of new advances in technology. The Center is currently testing the development of a lap-top communication system/workstation with Words+ Corporation and Toshiba. Morse code entry systems are also being tested. The Center is also pursuing funding for testing of optical scanning input systems and interactive videodisk applications.

Summary

Second year activities and accomplishments indicate that the Center is progressing on its goals of providing technology based service to students, developing a technology based Center for disabled students, and disseminating model project information. Second year highlights include:

1. Evaluation results indicating that Center activities have positively impacted student performance and attitudes (See Section III).

2. Increases in population served and substantial use of Center equipment and services.

3. Expanded dissemination activities in the areas of conference presentation and publications.

4. Work with IBM Corporation on creation of a Center brochure.

Results of formative evaluation activities as summarized in accomplishments related to Center Objectives indicate that the Center is making progress in realizing its primary goals.

C. Adjustments, Changes, Slippages

While substantial progress has been made in realizing all Center Goals, difficulties have been encountered. Issues and changes related to each program goal area will be summarized in this section.

Goal 1: Improve Student Academic Performance

The initial need to identify and/or develop appropriate assessment instruments and methods and develop applications of technology resulted in a delay in initialization of Center services. While most of the necessary assessment methods and intervention strategies were developed by the end of the first year, completion of full assessments on all students and implementation various aspects of training and service have been delayed longer than originally anticipated. It is only during the second year that the Center is fully able to supply all services. Plans are now underway to increase student use and provide more formal training in various center interventions to students.

As a result of delays in assessment and training component evaluation of training outcomes have also been delayed. Training to-date has been conducted on a one-on-one basis. Also, the technology and programs used have changed as new technology and software were identified. This makes process evaluation difficult since each training session differs substantially. Plans are being made to conduct more systematic, formal training activities with standardized materials and methods to allow evaluation of training in the use of equipment and software. This systematic service delivery is needed if Center activities are to be replicated.

A final service delivery issue is the recruitment of students to utilize services. Even with easy to use equipment and programs, many students exhibit apprehension about learning and using computers. Staff has found that initial apprehension is diminished and use increases substantially once the student is introduced to the available technology. However, a number of students still have not made use of Center services in any significant way. Activities in recruitment and familiarity with available services are needed to involve more students in Center activities.

The Center was unable to complete initially scheduled evaluation of student writing performance. Changes in the pattern of Center use by the initial student population and student drop outs resulted in a severely reduced follow-up sample making formal evaluation impossible. Thus, the proposed evaluation of writing progress could not be completed as scheduled in May, 1987. Writing sample continue to be obtained as students enter the Center and a new

evaluation of writing progress is being planned; however, this component of evaluation will have to be completed after the grant period is completed

Goal 2: Establish Educational Center for Disabled Students

Major difficulties in the establishment of the Center were detailed in the 1985-86 Final Report. As indicated in this report the identification of available equipment and identification of uses of the equipment and software proved to be more time consuming that anticipated. The primary difficulty, that is still being encountered, is debugging equipment and programs to make them operate. Significant implementation problems have been encountered with virtually all specialized equipment and software for the disabled. These problems with getting all the technology to work have slowed implementation of interventions needing the non-working equipment or software. Even with these implementation difficulties, however, all objectives in this area were on schedule during the second year.

Goal 3: Disseminate Model Project Information

The major barrier encountered in dissemination activities has been gaining initial recognition of the need for information in the area of technology among dissemination populations. Presentation and publication in professional forums is largely based on reviewed or juried systems of selection; thus, the Center can not directly control access to these dissemination forums. While the Center has actively pursued the submission of proposals, there have been audiences that have not been reached.

The Council on Exceptional Children, a primary forum for dissemination in the special education field, did not accept a Center proposal because they believed technology related interventions had only limited audience appeal. A proposal to the International Reading Conference concerning technology applications for enhancing reading and writing skills was also not accepted. If technology based methods for providing service to disabled students are to become widely used professionals must become more aware of the applications of technology. This will involve continued efforts to increase awareness of the importance of technology for the disabled. As long as technology is perceived as a limited aspect of disability service or as peripheral to primary service delivery, there will be difficulties in disseminating relevant information to audiences that could make use of technology.

Overall dissemination activities have progressed on-schedule. A Center goal for the third year is to provide increased amounts of formal dissemination materials to all audiences.

Summary

Overall the Center has made substantial progress in realizing its goals. Delays and problems encountered to-date have not necessitated substantial alteration in the initial goals, objectives, and time-lines. Center staff believe that the goals of the Center remain achievable and that objectives are realistic in terms of activities and timelines.

II. Client Population & Environment

This section will provide a summary of student demographics and work with other agencies/organizations. The first section will cover changes in the client population and client needs. The second section will summarize the survey of adjunctive services and cooperating arrangements with other service providers.

A. Demographics and Population Changes

The original number of students enrolling in the Center was 25. The number has progressively increased with 33 students using the Center in January 1986, 43 in June 1986, and as of January 1987 there were 65 students utilizing one aspect or another of the Center's program. The age of students participating in Center activities ranges from 50 to 18. Demographics and a summary of student needs are provided in Appendix J.

The number of severely disabled students entering the University is steadily increasing. The Center staff has been in contact with a number of students expecting to attend this coming fall who are coming from as far away as Arkansas and Massachusetts. It is anticipated that the student demographics will continue a trend toward a larger population of severely disabled students, especially students who have been mainstreamed through the school system.

The University population has been heavily weighted in the past toward those students with mild hearing or visual impairments and quadriplegics many of whom were in college when they were injured. The Center is providing the opportunity for students who have been disabled throughout their school careers to consider post-secondary education as a viable option.

Eligibility criteria for participation in the project is admission to the University and to be identified as disabled by the Handicapped Services Office. The bulk of the students using the Center are clients of the Nebraska Department of Rehabilitation Services.

B. Cooperating Agency/Organizations

Center staff as made a concerted effort to form working relationships with resources both within and outside the University. As specified in Center Objective 2.42, the Center attempts to develop cooperating relationships with other area service agencies. Forming a good working relationship with the Nebraska Department of Vocational Rehabilitation and the Nebraska Department of Services for the Visually Impaired has been especially important because of the large number of students involved in the Center who

are also clients of one or the other of these agencies. The Center has provided technical assistance in the purchase of a number of specialized systems for Vocational Rehabilitation clients. The log time and the Center evaluation results have been especially helpful in convincing Vocational Rehabilitation to purchase systems for clients. There have also been students using the Center who had originally been turned down by Vocational Rehabilitation as high risk students who are now receiving benefits as a result of their performance.

Cooperation with the Augmentative Communication Center at Barkley Memorial Center provides the Center with expert evaluation facilities for some of the more severely disabled clients especially those with speech problems. The Educational Center in turn provides opportunities for students to see actual technological applications.

The Center conducts an annual survey of adjunctive services (Objective 2.21) to identify potential referral sources and cooperative agencies. Results of the 1986-87 survey are provided in Appendix G.

III. EVALUATION REPORT

Center evaluation activities encompass both formative evaluation to provide input for change and enhancement of Center activities, and summative evaluation to provide outcome data on the success of Center activities as specified in Evaluation Plan Objective 2.52. This section will provide results from summative and formative evaluation activities for the second year.

A. Summative Evaluation Activities

A major accomplishment of the second year has been the completion of the initial summative evaluation. Evaluation Plan Objectives 1.5, 1.6, and 1.7 provide for outcome evaluation of student educational progress, progress in student writing, and change in student attitudes and perceptions concerning school. The Summative Evaluation Plan (Appendix D) specifies the areas of assessment related to each objective. As indicated in the 1985-1986 Final Report, an assessment was conducted in January and February, 1987 to obtain initial summative evaluation results. Future summative evaluations will be completed on the annual schedule provided in the Summative Evaluation Plan.

For the initial evaluation only the evaluation of educational progress (Objective 1.5) and the evaluation of student attitudes and perceptions (Objective 1.7) were completed. The evaluation of writing (Objective 1.6) was discontinued as previously detailed.

An initial overview of methodology and design will be provided. Next, summative evaluation outcomes will be presented by goal and objective as provided in the Summative Evaluation Plan. (Appendix D). For each objective, additional methodology considerations and results will be provided. Following the summary by objective an overall discussion of results will be provided.

General Methodology and Design Considerations

The current student population in the Center consists of both students who have been attending since the start of the Center and new students. For time-based, pre-post comparisons this creates a statistical confounding, since part of the group constitutes an independent sample and part of the group constitutes a dependent sample. Because statistical procedures are different for independent and dependent groups, two statistical procedures were done for each test.

The first procedure was to conduct an independent between group comparison, using the original student population as one group and new students as the second group.

Conceptually, this constitutes a comparison between a sample of students representing performance during the time prior to the Center (a baseline) and a sample of students representing performance since the Center has been operating. The hypothesis of interest in these comparisons is whether disabled students entering the university since the establishment of the Center perform relatively better than disabled students who were at the university prior to the establishment of the Center. For all of these tests the performance of the new students group for the fall semester 1986-87 is compared to the performance of the original student group for the fall semester 1985-86. An α level of .05 was established for significance testing for all between group comparisons.

The second procedure was to conduct a dependent within group comparison, using those students who had been at the university prior to the establishment of the Center and are still attending. The hypothesis of interest in these comparisons is whether the performance of the original student population has improved since the Center has been operating. For these tests two methods are used. For parametric measures (grades), a trend analysis was used assessing change across the fall semester 1985-86, the spring semester 1985-86, and the fall semester 1986-87. For non-parametric tests performance during the fall semester 1986-87 was compared to performance during the fall semester 1985-86. An α level of .05 was established for significance testing for all within group comparisons.

In addition, the performance of disabled students was, in selected cases, compared to the performance of the general student population. The purpose of these assessments was to determine if disabled student performance was approaching or within the range of average university student performance. Where statistical tests were conducted, the design utilized was a one-sample t - test. The performance of all university students was treated as a population value and the performance of all disabled students was compared to the population value to determine if it was significantly different [while the question of interest constitutes a goodness of fit question, the lack of distributional data for general university students precluded use of standard goodness of fit indicators so the t-test was utilized as an alternative]. For these tests both original and new disabled students were grouped together since the comparisons did not involve comparing disabled students over time or to each other. Since it was hoped that disabled student performance would not be significantly different, these tests constituted an attempt to prove the null hypothesis of no significant difference. In this case significance levels should be set so that rejection of the null hypothesis is relatively easy, since it is more important to guard against a false acceptance of the null hypothesis than a false rejection. An

α of .30 was established from general guidelines for goodness of fit type tests.

Results

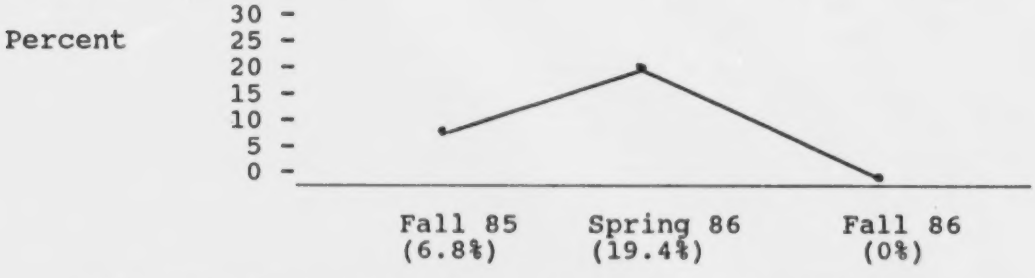
1. In-House Performance Evaluation Results

Objective 1.5.1 - Reduce drop-out rate for disabled students to levels equivalent to non-disabled student population.

This objective was established based on data from the initial literature review in the original grant supporting a belief that disabled students are at greater risk for dropping out and that an inordinately higher number of disabled students do not complete their university education. The relatively small number of disabled students enrolled at the university, however, makes exact comparison of drop-out rates impossible. Also, the majority of disabled students at the university have enrolled within the last calendar year, so an assessment of their ultimate drop-out pattern can not yet be established. Since the Center is designed to impact academic success, a more pertinent measure than drop-out rate, which may be due to non-academic reasons such as financial or personal considerations, is percentage of students on academic suspension or probation. It is those students with academic problems that are most at risk of dropping out, therefore, a reduction in students having academic problems should ultimately reduce the drop-out rate.

Drop-out rate was assessed by calculating the percent of disabled students who left the university in relation to the total disabled student population for each semester the Center has been in operation. No statistical tests were applied to this data.

Percent of Disabled Students Leaving School by Semester



The attrition of freshman students across three semesters is approximately thirty percent, therefore, the cummulative attrition for the original 29 Center students which totals 27% is within expected attrition rates.

To assess change in students on academic suspension or probation, both between group and within group comparisons were done. For between group comparison, a contingency table analysis (Chi Square) was conducted comparing the frequency of students on academic suspension or probation for new students during the fall 1986-87 semester to the frequency of students on academic suspension or probation for the original student population during the fall 1985-86. For within group comparison, a McNemar test for change was conducted testing the change in the frequency of students on academic suspension or probation for the original student population from the fall 1985-86 term to the fall 1986-87 term.

The contingency table for the between groups test is presented below:

	Not on Probation	On Probation	Total
1985 Students	16	13	29
1986 Students	17	3	20
Totals	33	16	49

The difference between the new 1986 students and the original 1985 student population was significant ($T = 4.789 > \chi^2 = 3.841$, $p < .05$).

Results of the McNemar Test for change for the original 1985 student population are summarized in the following table.

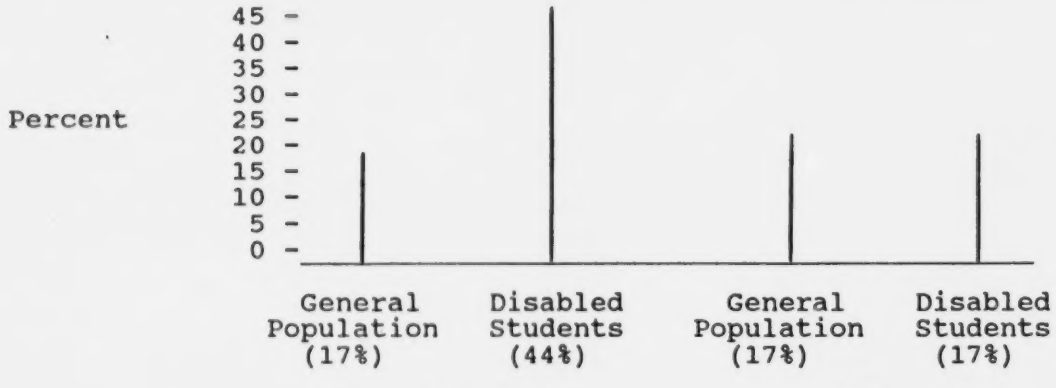
		1986	
		Not On Suspension	On Suspension
1985	Not on Suspension	11	1
	On Suspension	6	3

The test statistic is not significant ($T = 6 < 7$) at the .016 level using a binomial test. The approximate binomial level of significance achieved is .125.

The results of between and within groups tests of students on suspension and probation indicate that the number of students experiencing these academic problems has decreased during the time the Center has been operating. Students entering since the start of the Center are significantly less frequently on probation or suspension than students who were at the university prior to the Center. For the original student population there has been a decrease in students on suspension and probation, however, the change did not reach statistical significance.

To examine whether the frequency of disabled students on academic suspension or probation exceeds University wide averages, the percentage of all University students on suspension or probation was calculated for the first semester in 1985-86 and 1986-87. The percentage of disabled students on suspension or probation was calculated for the same semesters. Results are presented graphically below.

Percent of Students on Academic Suspension or Probation First Semester Disabled Students and General Student Population



A 1 X 2 contingency table analysis was applied to Suspension and Probation data to determine if the frequency of disabled students with academic problems was within normal University wide ranges. This test compares the frequencies of disabled students on suspension or probation to the expected frequency based on the University population frequencies. Tests were done for the original population of students prior to the Center and for the total student population in the fall 1986-87 (both original and new students combined). Results are reported in the tables below.

		Not on Probation or Suspension	On Probation or Suspension
Original Students	Expected Frequency	24	5
	Disabled Frequency	16	13

The calculated Chi-Square value for this table using Yates' correction is 13.59 which is significant at the .05 level.

		Not on Probation or Suspension	On Probation or Suspension
Current Students	Expected Frequency	34	7
	Disabled Frequency	34	7

The Chi-Square value for this table is zero, as the actual and expected frequencies are identical.

The results of contingency table analysis indicate that prior to the establishment of the Center there were significantly more disabled students on academic suspension or probation than would be expected based on University wide averages. The frequency of disabled students on academic suspension or probation following the last completed semester is not significantly different than what would be expected based on University averages. This indicates that over the time the Center has been in operation disabled student incidents of academic problems have moved from being more frequent than incidents in the general student population to the same frequency.

Objective 1.5.2 - Increase percentage of disabled students admitted to the University.

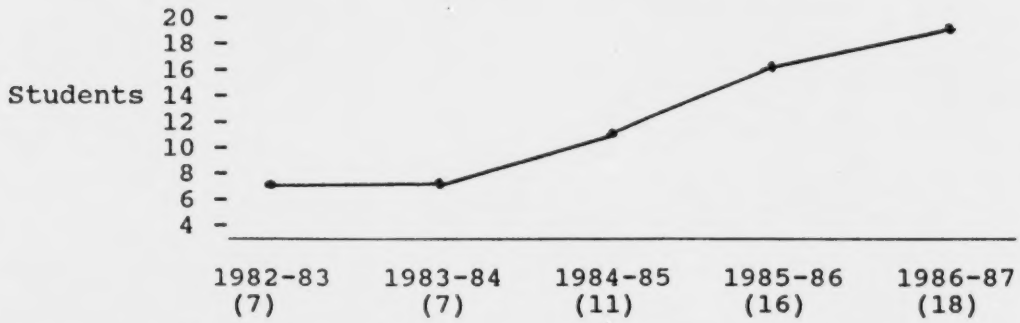
To test whether there had been an increase in disabled students admitted to the university since the start of the center, the percentage of new freshman disabled students admitted during the fall 1985-86 semester was compared to the percentage of new freshman disabled students admitted during the fall 1986-87 semester. Since the goal of the Center was to increase new enrollments, only freshman admissions were considered. Also, since the majority of new students enroll in the fall, only fall admission data were considered. While some students do enroll at mid-year, the high variability of these admission numbers makes percentage comparison misleading. Many of the disabled student freshman enroll during one of the summer terms prior to the fall of their freshman year to aid in adjustment to campus life; therefore, for disabled students summer freshman enrollments were combined with fall enrollments to arrive at new enrollment figures for both years. Due to the availability of other projects serving learning disabled students exact figures on learning disabled enrollment are unavailable; therefore, learning disabled enrollments were not included in the analysis. Since percentage data was being compared, no statistical tests were conducted.

During the fall of 1985-86, sixteen severely disabled students enrolled at the university out of a total enrollment of 3648 resulting in a percentage of less than 1%. During the fall of 1986-87, eighteen severely disabled students

enrolled out of a total of 3776 students also resulting in a percentage of less than 1%. These figures indicate that disabled students constitute a very small percentage of all student enrollments and that considerable potential for increasing disabled student enrollment exists. The percentages are too small, however, to indicate any trends.

As a second assessment of enrollment trends, the number of freshman disabled student admissions by academic year was obtained for the 1982-83, 1983-84, 1984-85, 1985-86 and 1986-87 school years. These are plotted in the following graph.

Disabled Student Freshman Enrollment by Year



The trend indicated in the graph shows that disabled student enrollments have been increasing for the last five years. The trend does not indicate that the Center has been a major factor in increasing enrollments to-date, since the large jump in enrollment began in 1984-85 and continued in 1985-86 prior to the establishment of the Center. It is anticipated that Center dissemination activities to parents, schools and prospective students will lead to increased enrollments, however, since the Center has been in operation only one full year, the impact of dissemination may not be apparent as yet.

Objective 1.5.3 - Increase overall grade average for students in the Center.

Two analyses of grade change were conducted. The first examined change in semester grade averages while the second examined change in overall grade average. As indicated in the general methodology section, two tests were conducted in each analysis. First, a between group comparison was conducted comparing the GPA of new students (semester and overall) for the first semester 1986-87 to the GPA (semester and overall) of the original student population for the first semester 1985-86. As noted, this constitutes a comparison between students entering since the Center was established and the students attending prior to the establishment of the Center. An independent t - test was utilized.

Second, a within group comparison was conducted examining the change in GPA (semester and overall) across semesters for the original student population. As indicated in the general methodology, this constitutes a test of the effect of the Center on students who had been attending prior to the establishment of the Center. The design used was a repeated measures analysis of variance (ANOVA) across the three semesters the Center has been in operation. Since repeated measures designs must meet the requirement of sphericity, a univariate repeated measures model was tested using the BMDP2V computer package to obtain epsilon estimates of sphericity. The generally accepted criterion of epsilon > .75 was not met for either semester or overall GPA models. Because sphericity was not met the analysis was conducted using a multivariate model with the Multivariance computer package. The multivariate repeated measures design is a test for a significant trend in the data. For the three semester designed used, the trends tested were the linear and quadratic. A significant positive trend would indicate that performance was improving over the time span examined.

Results of the independent *t* - test for the between groups comparison are summarized in the following table.

	Original 1985 Students		New 1986 Students				
	Mean	S.D.	Mean	S.D.	*t* Value	D.F.	Sig.
Semester GPA	2.216	.86	2.798	.89	2.30	47	.026
Cumulative GPA	2.293	.75	2.784	.69	2.32	47	.025

These results indicate that both the semester and cumulative GPA of students entering since the start of the Center are significantly higher than the semester and cumulative GPA of students attending prior to the establishment of the Center.

Results of the within group multivariate repeated measures tests are summarized in the following tables.

	Source	Multivariate F (Rao's)	Stepdown Tests Linear	Quadratic
Semester GPA	Time	$F(2, 18) = 4.22^*$	6.25*	1.89
Cumulative GPA	Time	$F(2, 18) = 4.84^*$	7.42*	1.91

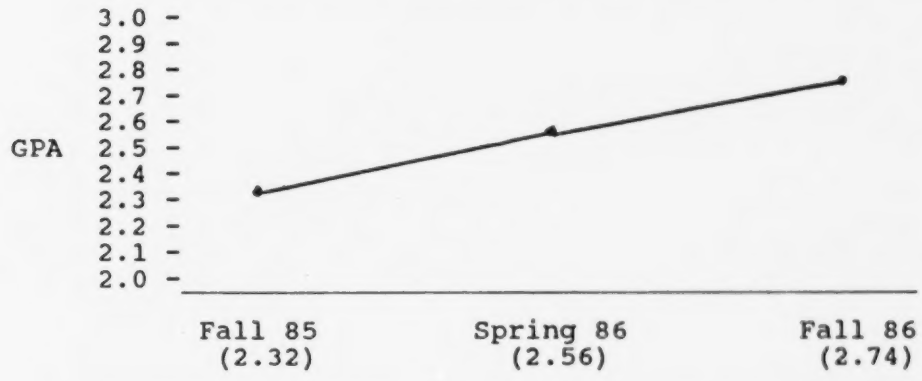
* $p < .05$

These results indicate that there was a significant difference in GPA across the three semesters of Center operation for the original student population for both

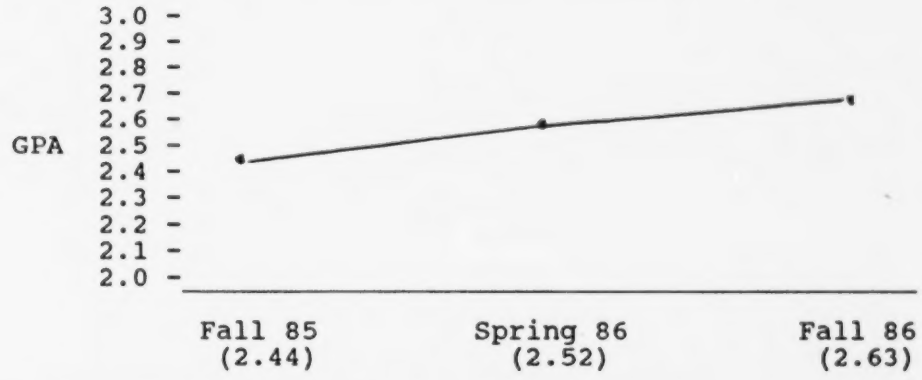
semester and cumulative GPA. Stepdown follow-ups indicate that the significant trend is linear in the direction of higher GPA in each succeeding semester.

Mean scores across the three semesters are presented graphically below for semester and cumulative GPA change.

Semester GPA for Original Students by Semester



Cumulative GPA for Original Students by Semester



Results of the analysis of grade change indicate that there has been a positive increase in GPA during the time of Center operation. New students show better performance than did the student population prior to the start of the Center and students attending the university prior to the start of the Center show significant improvement in their grades across the three semesters of Center operation.

Caution must be exercised in attributing the cause of these improvements in GPA to Center activities as other factors may influence academic performance. Regression results of Center use time on GPA (reported below) do, however, indicate a significant positive relationship between

use of the Center and higher grades. Thus, it appears that Center activities are likely exerting a significant influence on grade performance and the positive GPA changes identified are at least partially due to Center activities.

An additional examination of disabled student academic performance was done by comparing the cumulative GPA of all disabled students currently enrolled in the Center during the fall 1986-87 semester to the average University wide GPA. Comparison was done utilizing a 1-sample t - test.

	University Population	Disabled Students				
	Mean	Mean	S.D.	t Value	D.F.	Sig.
Cumulative GPA	2.95	2.71	.613	2.51	40	<.05

Disabled student cumulative GPA is significantly different than University wide average GPA at the .05 level. This finding indicates that while significant improvement in GPA is being accomplished, there is still need for further improvement if disabled student performance is to achieve levels equivalent to the general student population.

Objective 1.5.4 - Increase semester credit hour load to levels equivalent to non-disabled student population.

As indicated in the general methodology section, two tests of credit hour change were conducted. First, a between group comparison was conducted comparing the registered number of credit hours and the number of credit hours passed of new students for the first semester 1986-87 to the registered number of credit hours of the original student population for the first semester 1985-86. As noted, this constitutes a comparison between students entering since the Center was established and the students attending prior to the establishment of the Center. An independent t - test was utilized.

Second, a within group comparison was conducted examining the change in registered number of credit hours and number of credit hours passed across semesters for the original student population. As indicated in the general methodology, this constitutes a test of the effect of the Center on students who had been attending prior to the establishment of the Center. The design used was a repeated measures analysis of variance (ANOVA) across the three semesters the Center has been in operation. Since repeated measures designs must meet the requirement of sphericity, a univariate repeated measures model was tested using the BMDP2V computer package to obtain epsilon estimates of sphericity. The generally accepted criterion of epsilon >

.75 was met for both attempted and passed hours, so the univariate model was used for both analyses.

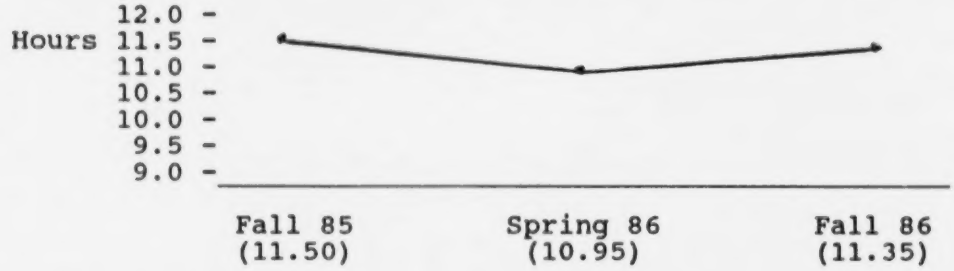
Results of the independent t - test for the between groups comparison are summarized in the following table.

	Original 1985 Students		New 1986 Students				
	Mean	S.D.	Mean	S.D.	t Value	D.F.	Sig.
Hours Attempted	11.62	2.97	11.70	2.49	.10	47	.922
Hours Passed	9.41	3.57	11.20	3.25	1.78	47	.081

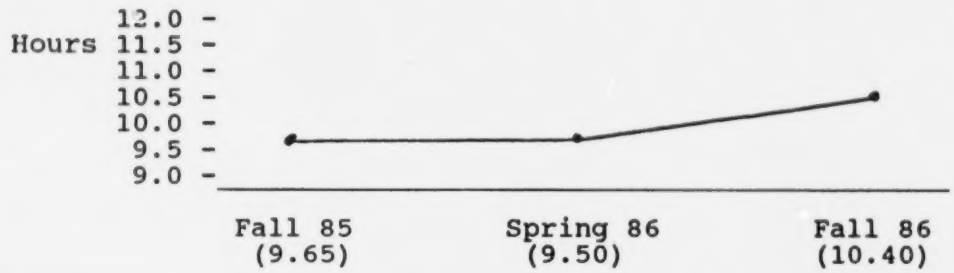
These results indicate that there is no statistically significant difference in credit hours attempted or credit hours passed between students entering since the start of the Center and students attending prior to the Center. The difference in credit hours passed did, however, approach significance and indicates a positive improvement in number of hours passed for new students.

Within group tests for the original student population analyzed mean credit hours across the three semesters of Center operation. Means are presented graphically below for semester and cumulative GPA.

Credit Hours Attempted by Original Students by Semester



Credit Hours Passed by Original Students by Semester



Results of the within group univariate repeated measures tests are summarized in the following tables.

Repeated Measures Results for Credit Hours Attempted

Source	S.S.	df	M.S.	F	Huynh-Feldt Prob.
Time	3.233	2	1.617	.38	.666
Error	160.767	38	4.230		

Repeated Measures Results for Credit Hours Passed

Source	S.S.	df	M.S.	F	Huynh-Feldt Prob.
Time	9.300	2	4.650	.78	.467
Error	227.237	38	5.983		

These results indicate that there was no significant difference in either credit hours attempted or credit hours passed across the three semesters of Center operation for the original student population.

To assess whether disabled student credit hour loads were within the normal range of credit hours taken by the general student population at the University, the number of credit hours taken by all disabled students in the Center was compared to the University wide average number of credit hours. Statistical testing was done using a one-sample t -test. University data was available only for attempted credit hours for the 1986-87 term, therefore, only attempted credit hours for all students in the Center (both original and new) were tested. Results are presented in table form below.

	University Population	Disabled Students				
	Mean	Mean	S.D.	t Value	D.F.	Sig.
Hours Attempted	13.90	11.49	2.62	5.89	40	<.01

This significant difference between the credit hour loads of disabled students and the average credit hour load for the general University population indicates that disabled students continue to take significantly fewer credit hours per semester than the general student population.

Since it is also important that students successfully complete the credit hours that they attempt, an analysis of the change in the number of students passing all attempted credit hours was conducted. Both between group and within

group comparisons were done. For between group comparison, a contingency table analysis (Chi Square) was conducted comparing the frequency of passing all attempted credit hours for new students during the fall 1986-87 semester to the frequency of passing all attempted credit hours for the original population during the fall 1985-86. For within group comparison, a McNemar test for change was conducted testing the change in the frequency of passing all attempted credit hours for the original student population from the fall 1985-86 term to the fall 1986-87 term.

The contingency table for the between groups test is presented below:

	Passed 100%	Not 100% Passed	Total
1985 Students	13	16	29
1986 Students	17	3	20
Totals	30	19	49

The difference between the new 1986 students and the original 1985 student population was significant ($T = 8.046 > \chi^2 = 3.841$, $p < .05$).

Results of the McNemar Test for change for the original 1985 student population are summarized in the following table.

		1986	
		Passed 100%	Not 100% Passed
1985	Passed 100%	10	3
	Not 100% Passed	5	3

The test statistic is not significant ($T = 5 < 7$) at the .07 level using a binomial test. The approximate binomial level of significance achieved is .14

These results indicate that there has been a positive effect on percent of credit hours passed during the time the Center has operated. A significantly greater percentage of students entering since the Center began pass all of their attempted credit hours than did students at the university prior to the Center. For students attending prior to the Center there has been an increase in the percentage of those passing 100% of attempted credit hours, however, the change in percentage is not statistically significant.

Objective 1.5 (Supplemental)

An additional assessment of the direct effect of use of the Center was included as a supplement to the Summative Evaluation Plan. For this analysis a log of Center use was kept by staff during November and December, 1986. These logs provided a sample of student use of the Center. Total Center use time was computed for each student.

Semester GPA for the fall 1986-87 semester was regressed on hours of use to determine if use time predicted academic performance. The total student population during the fall 1986-87 semester (both original and new students) was used in the analysis.

Regression results for GPA are summarized in the following table:

Regression of Semester GPA on Center Use Time

N	R	R	F	df	Sig.
41	.368	.136	6.12	(1, 39)	.018

Regression results indicated that number of hours of Center use was a significant predictor of GPA for the fall 1986-87 semester. Use time accounted for approximately 14% of the variance in GPA for Center students. This finding suggests that Center use is related to better academic performance.

2. Outside Consultant Evaluation Results

Summative evaluation for Objective 1.7 is conducted by the Center's outside evaluation team under the direction of Dr. John Berman. This team administers the Intake Questionnaire to new students and a follow-up questionnaire to examine change. Complete results and the Evaluation Report from Dr. Berman are provided in Appendix F. This section will summarize major findings related to the three summative evaluation objectives for Objective 1.7.

Objective 1.7.1 - Decrease time spent on mechanics of school related tasks.

This objective was tested through a pre-post assessment using the Intake Questionnaire. Students were asked to indicate the number of hours per week spent on written work. Results are reported in the following table.

Hours Per Week Spent on Written Work

Pre-Test Average	Post-Test Average
7.4	5

A t - test conducted on the change was not significant (t = 1.91, p = .08), however, change was in the direction hypothesized. In non-statistically analyzed questions students did report spending less time on written work and on general school work. No change was found for student distribution of time spent studying.

Objective 1.7.2 - Improve student self perception of academic ability.

Perceptions of ability were assessed through multiple questions concerning confidence in various academic areas and causality for success and failure in course work. Significant results were found for disability related causal attributions. Difficulties in courses were significantly less attributed to disability condition (p = .02) and success was significantly less attributed to teach accommodations to disability (p = .03). Non-significant increases were also found for success attribution to hard work and success. Together, these results indicate a trend toward more internal and non-disability related attributions for success.

Confidence in course work was found to significantly improve only for foreign languages. This likely occurred due to a high frequency of Center students who were enrolled in foreign language courses during the past year. Since most were successful, they undoubtedly felt more confident in this area. Confidence in other academic fields did not significantly improve, but also, did not decrease.

Discussion

Results of summative evaluation activities indicate that the Center has had a positive effect on disabled students participating in Center activities. The primary effect has been an overall improvement in academic performance as indicated by significant improvement in semester and cumulative GPA for all students during the time the Center has been operating. Regression results indicate that Center use is a significant predictor of better grades strengthening the belief that the Center is a causal factor in grade improvement.

An additional academic improvement has been the decrease in students on academic probation or suspension. Students entering since the Center began have significantly less instances of probation or suspension than students did prior to the start of the Center. Level of suspension and probation have now dropped to the same level as that of the general University population.

Non-significant increases in credit hour loads and credit hours passed were found. However, a significantly

higher proportion of students entering since the establishment of the Center are passing all attempted credit hours than students did prior to the start of the Center.

These trends indicate that the Center is positively affecting the academic success of disabled students at the University. These improvements are somewhat reflected in student self-perceptions of ability and causality for success in school as identified in the Intake Questionnaire follow-up. These initial findings are encouraging and suggest that the intervention and service approach taken by the Center are effective in meeting the needs of disabled students in the academic environment. Further improvement is expected during the remainder of the Grant period, as students increase their utilization of Center services and Center interventions are more fully implemented.

The results obtained, also, provide evidence that the Center program can be beneficial if replicated in other post-secondary settings. Center activities and interventions are organized around readily available equipment and software and have been defined in enough detail to be implemented by other sites. It is the belief of Center staff that the evaluation results obtained provide evidence that the Center is successful as a model demonstration project.

B. Formative/Process Evaluation Activities

Formative evaluation activities are summarized in the Center's Formative Evaluation Plan (Appendix A). Timelines for these activities are also provided in Appendix A. Objectives 2.51 and 2.52 specifically specify that the Center will develop and update an evaluation plan and conduct semi-annual evaluations of activities. Summative outcome evaluation results were presented in the previous section. This section will document and describe formative process activities and results.

1. Process Evaluation Activities

Process evaluation activities are designed to document and assess existing program activities. The purpose of this evaluation is to determine implementation of program services and completion of defined program tasks. Process evaluation is conducted on each of the three goals of the Center. These will be summarized in this section.

Goal 1

Center Goal 1 is to improve student academic performance. Process areas evaluated under this goal are completion of assessment activities, types and levels of interventions provided, and staff activities related to assessment and training. Main process evaluation questions concern what assessments are required, what types and levels of training are needed, and what levels of staff involvement are needed to implement assessment and training activities. Primary instruments utilized to examine assessment and training processes are the Center's Needs Assessment and student activity logs.

Assessment needs were identified and instruments were developed during the first year leading to the development of the IPO Model as described in the 1985-86 Final Report. Second year activities were directed at continuing to refine existing instruments and determine additional assessment needs. These efforts resulted in updating the Needs Assessment instrument (Appendix E) and developing procedures for conducting the assessment interview (Appendix E). Third year activities in this area will involve work with the Augmentative Communication Center at the University to develop a formal comprehensive technology based assessment procedure.

Training activities were initially evaluated in relation to student needs identified in the needs assessment and a survey of existing equipment and software. The initial identified interventions were grouped into technological, skill training, and adaptive intervention strategies (Appendix I) as detailed in the 1985-86 Final Report. Under

Objectives 2.11, 2.12, 2.21 and 2.22 Center staff have continued to assess student needs and available equipment and software. These activities have identified the major types of student needs that can be met through technology and skill training with existing equipment and software. The uses and purpose of each intervention and the appropriate population are provided in Appendix I.

During the second year, the staff has begun to keep use logs on students in the Center. These logs provide information on amount of time students use the Center and their activities. This data provides information on both overall use and use of specific intervention strategies. To date only global use figures have been calculated for use in the summative evaluation. These figures indicate that during the months of November and December, 1986, students used the Center a total of 415.05 hours and during the last week in January and all of February, 1987 students used the Center a total of 203 hours. These figures indicate a high use of Center services by students. During the third year logs will be categorized by type of intervention or service provided to obtain a breakdown of specific Center use. Other planned third year activities include the continuation of logs and individual, single-subject design tracking of progress with specific interventions.

In addition to assessment of student activities, there is a need to identify staff activities related to assessment and interventions. Replication will require knowledge of how staff implements designed treatments and how staff conducts assessment. To gain this information a staff activity log will be implemented during the third year to provide a summary of staff activities with students. This information will be used to formalize assessment and interventions for replication.

Goal 2

Center Goal 2 is to establish the physical aspects of the Educational Center and its services. Process areas evaluated for this goal are assessment of population needs (Objectives 2.11, 2.12), identification and obtaining of equipment and programs (Objectives 2.21, 2.22,) and identification of adjunctive services and arrangement of cooperative agreements (Objectives 2.41, 2.42). Process activities related to these objectives concern developing a general disability needs profile, updating resource materials and surveying potential adjunctive services. Process concerns are that information sources in these areas be updated on a systematic basis. To meet these updating needs, the Evaluation Plan specifies a semi-annual updating of population profiles and equipment and software materials and an annual update of adjunctive services.

The first process activity during the second year has involved updating the student population needs. Each semester, student Needs Assessments are combined to develop a Center population profile of disability types and technological and educational needs. The population profile is used to summarize the needs of current students and to examine trends or new need areas that must be addressed. Population characteristics were discussed in Section II and Appendix J contains the latest update of demographics and needs. Updates will continue on the scheduled semester frequency during the third year.

The second process activity during the second year has involved updating the Bibliography of Information Sources (Appendix K) for equipment and software. These references are required for replication projects needing to find available technology. An additional activity has been the development of a vendor list of acquired equipment (Appendix L). In addition contact has been maintained with IBM corporation and local dealers concerning new product developments.

Updating of adjunctive services is completed annually, through a survey of University and local services. Results of this survey are provided in Appendix G. The listing of available adjunctive services provides information for potential referrals and auxiliary services that may be identified in student needs assessments.

Goal 3

Goal 3 concerns development of model project information and dissemination of program findings. Process evaluation areas for this goal involve compiling and updating dissemination materials (Objective 3.2) and tracking arrangement and completion of dissemination activities related to the dissemination objectives (3.3, 3.4 and 3.5). Process concerns are that materials are completed on a timely basis and that response is made to dissemination opportunities.

The process goal for updating dissemination material is that all materials will be reviewed and compiled on a semi-annual basis. During the second year, the staff has compiled new information on the Center's student assessment methods to respond to significant inquiries concerning assessment materials, updated the Center Intervention Strategies material to add newly identified and formalized interventions, completed a paper on evaluation methods and completed a paper on Center uses of technology. These materials supply a base for future development of replication materials and a data base for presentations and future publication. Additional reports on Center activities have been compiled for the Center Newsletter. These activities

indicate that the staff is meeting its objective of periodically reviewing and updating materials.

Center activities in the area of exploring dissemination opportunities have involved both response to formal calls for papers for conferences and direct work with professionals and industry to develop dissemination vehicles. Center staff have submitted nuberous conference proposals during the second year and are in the process of developing proposals for third year presentations. Work with professionals has resulted in invited workshop presentations at two regional conferences. Contact with the IBM Corporation has resulted in the production of a brochure on the Center for distribution throughout the IBM affiliated business and other academic institutions (Appendix N). Details on these activities are contained in Section IV of this report. Efforts during the second year indicate that staff are pursuing dissemination opportunities in a timely manner.

2. Program Development Activities

Program development activities are directed at gaining information for refinement of program services and development of new services. These activities broadly relate to the context of the Center as a model demonstration project who's primary purpose is the generation of replication information for dissemination. To meet the needs of providing a model technology based project, Center staff must engage in information gathering beyond that required to address immediate service and facilities concerns.

The primary method of program development is the formal evaluation of Center activities under the Summative Evaluation Plan (Appendix D). Results of the initial summative evaluation were reported in the previous section. The information gained on the effectiveness of Center activities provides feedback on where changes and additions to Center interventions may be necessary. The major development activity for the second year was the analysis of the evaluation results and identification of areas to be addressed based on these results. This analysis will allow the refinement of both service strategies and future evaluation activities for third year replication efforts.

The only specific development objective stated in the Center Evaluation Plan is Objective 3.7 concerning testing of prototype equipment. The purpose of this development activity goes beyond the identification of technology for establishing the Center. Prototype testing allows input from the Center into the development of new equipment through working relationships with industry and manufacturers of the technological equipment. Through these activities the needs of disabled persons can be expressed to manufacturers during the development of the products to help make these products

more usable for the disabled.

Currently prototype testing is underway with the Words+ Corporation concerning new applications of scanning, Morse code entry systems and word prediction software, with Toshiba Corporation concerning the development of portable communication system workstations, and with IBM Corporation on the testing of an interactive videodisk system. The Center is also conducting on-going testing of optical character recognition systems and is surveying and testing new models. These activities will be beneficial in developing more usable adapted systems for the disabled.

In many respects most of the first year activities summarized in the 1985-86 Final Report were involved in development of a technological educational center for the disabled. Now that the initial establishment of the Center is complete development activities are more targeted to detailed data-based refinement of the initially developed equipment and services and to the development of new technology. These efforts will be continued during the the third year.

3. Client Satisfaction/Attitude Survey Results

Objective 1.7.3 of the Summative Evaluation Plan concerns evaluation of student attitudes concerning the Center and school work. The Intake Questionnaire and follow-up conducted by the Center's outside evaluation team headed by Dr. John Berman assesses student satisfaction with the Center. The first follow-up survey was completed in January, 1987 assessing satisfaction for the initial student population entering the Center when it began. Summary results will be reported in this section. Detailed results are contained in Dr. Berman's summary report (Appendix F).

Sixty percent of the students surveyed in the follow-up felt that the program had been helpful. Fifty percent felt less intimidated by computers as a result of the Center. Twenty-nine percent of the students reported that the program brought about changes in the types of courses in which they did well. Changes were not found concerning attitudes about future course performance and graduation possibility (though a ceiling effect may have occurred as 90% felt they would graduate in the initial survey at intake). These results indicate general satisfaction with the Center and Center activities on the part of students. Also, some changes in attitudes concerning computers and coursework are indicated.

It was hoped that more significant improvement in attitudes and satisfaction would be found. However, a potentially confounding variable is the change in student use patterns over the time the Center has operated. Follow-up surveys for this analysis were done on the original students

who first signed up to participate in the Center when it started. Over the year and a half since start-up a number of the original students have become only infrequent users of the Center while many students who were originally not interested in participating have become heavy users. The follow-up survey, therefore, does not provide a good sampling of the current student population utilizing the Center. The next follow-up survey may provide more complete information on client satisfaction and attitude change as a larger number of students will be included (all who have entered school during the last year and a half) and a more representative population will be assessed.

IV. DISSEMINATION ACTIVITIES

Goal 3 of the Evaluation Plan specifies that the Center will disseminate model project information to parents and students, the business community, and other post-secondary institutions. Specific objectives provide for compilation of information in a format suitable for dissemination and providing information to a variety of audiences (see Appendix A). This section of the report will detail second year dissemination activities. First year dissemination was reported in the 1985 - 1986 Final Report.

A. Professional Reports and Presentations

Objective 3.3 specifies that Center staff will provide information to other education and service professionals through presentations, workshops and publication. The goal of these dissemination activities is to provide detailed information on Center activities and interventions for the purpose of furthering replication. Second year activities in this area have centered on presentation at relevant professional meetings and preparation of publication materials for professional journals.

Second year presentations were done at the following conferences:

1. Closing the Gap 4th Annual Conference on Microcomputer Technology for Special Education and Rehabilitation, Minneapolis, MN., October 23-25, 1987. This presentation provided information on and demonstration of the Center's technological, skill training and adaptive interventions with a focus on the integration of technology with educational training.

2. EVALUATION '86 Conference (American Evaluation Association), Kansas City, MO., October 30-31, 1986. The paper "We Do - They Do: A Model For Practical Service Program Evaluation" was presented covering aspects of the Center's Evaluation Plan and the model utilized for formative evaluation activities.

3. Conference on College Composition and Communication (CCCC) Annual Convention (National Council of Teachers of Education), Atlanta, GA., March 19-21, 1987. The paper titled "Computer Technology for Enhancing Disabled Student Writing: Applications and Limitations" described the technological and adaptive intervention strategies utilized by the Center to improve writing performance.

4. 1987 SETS [Council on Exceptional Children (Technology and Media division) Kansas Chapter]

Conference, Salina, KS., March 12-13, 1987. Center staff was invited to do a general session presentation on Center technological, skill training, and adaptive interventions and how-to information on utilizing these interventions in a variety of educational contexts.

5. K-AHSSPPE (Kansas Association on Handicapped Student Service Programs in Post-Secondary Education) 1987 Spring Conference, Council Grove, KS., April 8-10, 1987. Center staff were invited to provide a general session presentation which will focus on replication information for establishment of similar centers utilizing the interventions developed in the Educational Center for technology and adaptive computer access.

6. AHSSPPE (Association on Handicapped Student Service Programs in Post-Secondary Education) '87, Capitalizing on the Future, Washington, DC., July 22-25, 1987. This presentation entailed participation in a topic session on computer applications in post-secondary education setting.

The following second year manuscript was published.

The Educational Center for Disabled Students: An Integrated Technology and Cognitive Skills Program for Disabled College Students. 1986 Closing the Gap Conference Proceedings.

An additional manuscript titled "Effects of a Computer Based Educational Center on Disabled Students' Academic Performance" was submitted and accepted for publication by the Journal of College Student Development.

Two manuscripts were submitted to the ERIC resource center for inclusion in the ERIC data base. These were:

1. Computer Technology for Enhancing Disabled Student Writing: Applications and Limitations, based on the presentation at the CCCC conference

2. We Do - They Do: A Model For Practical Service Program Evaluation, based on the EVALUATION '86 conference presentation.

The Center is waiting for conformation from ERIC on the acceptance of these manuscripts.

These professional dissemination activities have been successful in providing information about the Center and Center assessment and intervention techniques to a broad range of regional and national audiences. Evaluation

feedback from conference presentations has been very positive and they have generated considerable interest in Center activities.

Third year professional dissemination activities are still in the planning stage as the Call for Papers for many 1987-88 conferences are just being received. Plans are to target presentations toward new audiences and to focus presentations toward how-to workshops and similar replication related activities and toward presentation of evaluation results and program outcomes. Less emphasis will be placed on presentations designed to provide general awareness of the project and technology for the disabled.

B. Outreach Activities to Schools, Parents, and Community

Outreach Activities as specified in Objective 3.4 involve providing information to parents, prospective students, regional school systems and community programs/agencies involved with disabled persons. These activities are focussed on increasing awareness of the Center and Center services among groups involved with educational and career planning for disabled students. The goals of these activities are to increase the awareness of disabled students and their parents of educational opportunities and to provide information for more effective educational and career decision making among those working with disabled students in educational and career decision making.

The primary vehicle for outreach activity is the Center newsletter Outreach. This quarterly newsletter is distributed to secondary school districts regionally, post-secondary institutions nationally, and regional service agencies. The newsletter provides information on Center services and activities, technology for the disabled, information sources, and upcoming conferences. The newsletter has been effective in generating requests for additional information from a variety of schools and agencies (see Part E on information requests). Appendix M contains copies of second year newsletters to-date. As previously indicated, the Outreach newletter is being replaced by the newletter of the AHSSPPE computer SIG as a disemination vehicle.

Additional outreach activities have involved meeting with prospective students and their parents and conducting meetings and facility tours for groups representing regional schools and agencies. These activities have increased awareness of Center services and have resulted in increased requests for additional information and contacts concerning prospective student enrollment. Vocational Rehabilitation has been purchasing computer systems for a number of the students because they can see how they can facilitate performance. There appears to be an increased awareness that

college is a viable option for disabled students seeking advanced education and career training. These effects are supported by the increased enrollment figures detailed previously.

Third year activities in this area are expected to continue in a similar manner to the second year. The newsletter will continue to be published and both formal and informal contact will be made with secondary schools, parents, students and agencies.

C. Business Community Dissemination

Objective 3.5 specifies that the Center staff will provide information to the business community concerning technology and work site adaptations for disabled workers. The goal of these activities is to increase employment of disabled college students and to increase awareness in the employment community of relevant technology and adaptive equipment for facilitating disabled employees. The major activities in this dissemination area during the second year involved working cooperatively with major computer manufacturers in disseminating information to the business sector.

The major second year accomplishment in this area has been work with the IBM Corporation, Academic Information Systems Office in the preparation of a program brochure. IBM representatives spent three days in the Center, during February, 1987, interviewing students, staff and university officials and observing technological applications for the disabled. The brochure (Appendix N) details Center activities and uses of technology for the disabled in the educational and work setting. Distribution will be made by IBM to their affiliated businesses and approximately 3,000 colleges and universities world-wide. This project will heighten awareness of technology for the disabled throughout the business and educational communities and will provide dissemination on a much wider basis than could otherwise be undertaken.

The Center staff has also worked extensively with the IBM Educational Systems Office in the sharing of information about available technology and in providing consultation on technological adaptations. The IBM Educational Systems Office refers many inquiries to Center staff which has provided a national base for disseminating information on adaptive technology to education, business and industry. This working relationship is expected to continue and expand during the next year.

Work with IBM has provided a valuable dissemination avenue. The Center is also pursuing cooperation with IBM in testing and evaluating new products and equipment. It is

hoped that the relationship established to-date will continue to grow and expand. A working relationship with IBM holds the potential for both development of new technology and dissemination to a wide audience.

In addition to the work with IBM, Center staff has also been working with the regional representatives for the Toshiba Corporation (ECZEL Company in Kansas City, MO) and Words Plus Inc. on the development of a portable work/communication station utilizing the Toshiba Portable Computer. This work has resulted in Toshiba representatives visiting the Center and the possible donation of test equipment to the Center.

These dissemination activities with computer manufacturers and developers of specialized aids for the handicapped provide the computer industry with information of the needs of disabled students and help sensitize manufacturers to accessing and use issues. Hopefully, the continued providing of information to computer manufacturers will result in a greater awareness of disability issues in the design and production of new equipment and as well as encourage work in the development of disability aids and technology. Besides the direct information sharing with the computer manufacturers themselves, these contacts provide a broad dissemination network as information is passed to the users and customers of these manufacturers.

Third year business dissemination activities will focus on continuing the established working relationships with IBM and Toshiba and attempt to develop new cooperative relationships with other major technology industries and manufacturers. As technological adaptations are developed, dissemination of work site modifications will be provided through presentations to business groups and publications.

D. Dissemination Methods and Materials

Objective 3.2 specifies that Center staff will compile relevant dissemination information and prepare dissemination materials. Materials are to be reviewed and updated semi-annually. This schedule coincides with the semi-annual evaluation and progress reports and insures that new data is incorporated into dissemination material as it becomes available. A diverse array of dissemination vehicles are used to accommodate the different audiences targeted by Center staff. Materials and methods for dissemination to each target audience will be summarized in this section.

The first dissemination audience is the OSERS funding agency. The primary dissemination materials to OSERS are the mid-year evaluation and progress reports (in conjunction with the continuation grant application) and the year end final report. These materials supply a detailed report on Center

activities and evaluation outcomes. The format of this report follows Transition Institute guidelines as set forth in the working paper "Developing the Final Evaluation Report". An additional executive summary is also provided highlighting key activities and evaluation results.

The second dissemination audience consists of other education and rehabilitation professionals working with disabled populations. Dissemination materials and methods for this audience primarily consist of presentations at professional conferences and meetings and publications in professional journals and other literature. These forums allow formal presentation of developed interventions, identified computer technology and its uses, evaluation methods, and evaluation results. These dissemination materials add to the general body of scientific knowledge and practice in the fields of education and disability service and provide information for replication of Center activities.

Professional audiences also receive general information through the Center newsletter and brochure. These sources provide awareness and descriptive information on Center activities and outcomes. This material fosters information requests and contact with other post-secondary institutions and service agencies. A final avenue of dissemination to professionals involves responding to information requests and the distribution of developed replication materials and working papers. These dissemination materials provide information to other projects who wish to implement Center assessment, intervention or evaluation methods.

The third dissemination audience consists of prospective students, parents, and other school systems. The purpose of these dissemination materials is to increase awareness of the Center and its services among the current and prospective client population and those involved in educational/ vocational planning with students. The initial dissemination contact with these audiences is often the Center newsletter and brochure which provide general program information and contact information. Additional information is provided though phone and personal contact concerning services and entry to the University. A major focus of third year activities will be to educate the school systems concerning the importance of providing disabled students, who have college potential, appropriate college oriented curriculum.

The fourth dissemination audience consists of the business and employment community. The business community needs to be aware of the availability of computer technology that can allow disabled persons to be productive in the work place. Dissemination materials and methods for this audience include the IBM brochure, presentations for business groups, and written reports on technology adaptations. Disabled student interns have been assigned in a number of businesses

through the University Internship office. One of the students has been offered a part time job. This method of exposing the business community to disabled students may well prove to be one of the best.

The fifth dissemination audience includes the advisory committee and University administration. The primary dissemination material for this audience is the executive summary report prepared in conjunction with the mid-year and final year-end reports to OSERS. These audiences also receive the Center newsletter to update them on on-going activities.

The final dissemination audience consists of cooperating agencies and programs. These agencies receive various materials at their request, including evaluation reports, presentation papers, publications, working papers, equipment and curriculum evaluations and replication material. A final method of dissemination to this audience is individual consultations and meetings to share on-going activities, new product information, referrals, and general information.

Third year dissemination activities will continue the development and distribution of new materials. The particular focus of third year dissemination will be on the development of replication information and materials for use in establishing and operating similar programs. In conjunction with the focus on replication, presentations will be geared toward how-to workshop formats, rather than information transmission. A concerted effort will be directed on completing professional publications to add findings to the professional knowledge base in the disability service field. Efforts will also be directed at developing materials for sharing information on technology for the disabled with the business community.

E. Information Requests

Information requests have been primarily generated from the newsletter and conference presentations. These requests have asked for information about the original proposal, the needs assessment form, our cognitive skills strategies, technological interventions, and copies of various papers presented at conferences. Copies of available material and working papers have been sent in response to these requests.

In addition to providing information in this manner, a number of groups have requested the opportunity to visit the Center and be shown the various equipment and how it is utilized. These groups include the Lincoln Public Schools Special Education Technology Network, a representative from a regional Veteran's Administration Rehabilitation Program, and a number of groups of professionals working with clients through Vocational Rehabilitation.

V. REPLICATION AND PROGRAM PRODUCTS

As a demonstration project, a primary goal of the Center is to develop materials and methods to allow replication of the program in other sites. A major focus of third year activities will be on the development and production of materials for replication. Second year activities and planned third year activities and products will be summarized in this section.

A. Replication Activities and Planning

Replication activities are conducted under Goal 2.0: Establish Educational Center for Disabled Students and Goal 3.0: Disseminate Model Project Information. While no specific program objectives directly address replication, the dissemination objectives of the Center, specified in Goal 3.0, are directed toward providing information obtained during the establishment of the Center in a form suitable for replication by others.

To foster replication, information must be disseminated in the following areas:

1. Available technological equipment and software for establishing a similar program.

2. Assessment of disabled student academic needs related to educational use of available technology.

3. Organization and use of identified equipment and software for addressing student academic needs.

4. Evaluation methods for assessing effectiveness and student progress.

Replication activities in these areas will be summarized in this section.

1. Technology and Software

Objectives 2.21 and 2.22 direct Center staff to conduct assessments of available technological hardware and program software to identify existing equipment and programs for meeting disabled student educational needs. Objective 3.7 specifies that staff will work to identify and test prototypes of equipment and software to determine the feasibility of utilizing this equipment to meet disabled student needs. These objectives are designed to keep Center staff up-to-date on current available technology and new developments in the field.

First year staff efforts were devoted primarily to assessing and procuring equipment and software to begin

Center operations, as detailed in the 1985-86 Final Report. The Center currently has a variety of information on equipment and programs, both general purpose and specifically designed to aid the disabled that could be utilized by others wishing to establish a similar program. This information has been summarized in an inventory and vendor list (Appendix L). In addition, a bibliography of sources has been prepared indicating where information can be obtained on technology and software (Appendix K). All of these are currently available on request.

Current activities in prototype testing involve work on a portable speech communication system/workstation based on the Toshiba Portable Computer, testing of an internal speech board, testing of Morse code entry systems, and evaluation of optical scanning technology. On-going testing projects involve the use of portable computers for in-class notetaking and writing, development of the cognitive study skills program, and continued examination of keyboard alteration/ abbreviation entry software. Details of these on-going projects were provided in the 1985-86 Final Report. The technical reports and assessments of these products will be produced and made available when testing is completed.

Third year activities will involve the development of a resource book of technology and software particularly applicable to college and business community for distribution to other programs. Announcement of the availability of this will be done in the Center Newsletter and in other relevant publications.

2. Academic and Technological Assessment

The use of computers, other technology and software in an educational setting requires assessment methods that can address both educational needs and ability to access technology. Center Objective 1.1 specifies that each student's needs will be assessed for the purpose of developing an Individual Educational Plan for the student. Objectives 2.11 and 2.12 specify that a general assessment of population needs will be completed. These assessment needs differ from more traditional assessment issues involving determination of existence and level of disability. Key assessment issues for a program such as the Educational Center are (1) what educational difficulties result from disability and (2) what adaptive needs do disabled students have for accessing technological equipment and programs.

The Center has adopted an information processing approach to assessment utilizing the IPO (Information -Processing -Output) Model developed by Center staff. This assessment model focuses on the impact of disability on educational tasks in terms of sensory, motor skill, and cognitive processing difficulties resulting from the

student's disability. The goal of the assessment is to identify where technology can be used to alleviate or compensate for disability related difficulties in performing necessary educational tasks. Details of this model are available in the 1985-86 Final Report.

Assessment must also be done to determine ability to use computers, software and other technological equipment. This assessment must identify where alteration must be made to equipment or programs to allow disabled students to effectively use the technology. Details of adaptive issues are provided in the 1985-86 Final Report.

To aid in replication the Center has developed an assessment form focussing on adaptive and educational needs that is used in conjunction with an interview, performance tasks, and other available data. Since an overview of this assessment procedure was provided in the Center newsletter, requests for assessment materials has become one of the most frequent information requests received. Currently, the Center has available the assessment form and a short letter indicating how the form and interview are used. Copies of the form and letter are provided in Appendix E.

Third-year replication activities in this area will involve the development of an assessment manual for conducting an IPO assessment. Due to the large interest in assessment indicated to-date by information requests, a formal manual seems justified as the best vehicle for providing replication information in the assessment area. Work on this manual will be done in conjunction with cooperating programs and agencies to try to provide a comprehensive assessment package for technology use in the disability field.

3. Organization and Use of Technology

A major first year finding, as detailed in the 1985-86 Final Report, was that to be effective, technology must be organized into a treatment package and integrated with other educational and skills training. For replication of the Center, information on how to most effectively use technology must be included in addition to simply listing sources of technological interventions and assessment instruments.

The organization and use of technology is summarized in the Center intervention strategies (Appendix I) and is detailed in the 1985-86 Final Report. As with assessment, technology has been organized around the IPO Model. Uses of technology fall into three broad categories. First, there are technological interventions to address sensory and motor skill difficulties. These types of interventions allow disabled students to obtain educational information and to communicate in the educational environment. Second, there

are skill training interventions designed to use software and educational materials to aid students in educational skills such as notetaking, language comprehension, writing skills, and background knowledge. These types of interventions allow disabled students to utilize the information they obtain and to better use the technology. Third, there are adaptive interventions that are designed to allow access to computers by the disabled. These interventions allow disabled students to operate the computers and software.

The particular strategies developed to-date are designed to facilitate the disabled student's educational opportunity. When combined with assessment under the IPO Model, these strategies allow the technology to become a treatment tool that can be directed at specific student needs in the educational environment. It is this combination of assessment and intervention that makes the Center more than just a computer room. Full replication requires that programs wishing to duplicate the Center also provide more than a computer room.

Third-year replication activities in this area will involve development of an intervention manual with how-to instructions on utilizing the intervention strategies developed in the Center. As new prototypes and new software are tested, it is anticipated that further strategies can be defined and integrated into Center interventions.

4. Evaluation Methods

As with any treatment program, it is critical that evaluation be made of impact and effectiveness. With a technology based program it is also necessary to test equipment and uses of the equipment to determine effective interventions and usability. Since the computer technology field is constantly changing with new equipment and software, replication of the Center requires consistent ongoing evaluation to identify new technology and new uses of the technology. In many respects a technology based program such as the Center is constantly in development due to the ever changing nature of the technology field. This means that evaluation strategies must be geared toward formative, process based evaluation as well as the more traditional outcome assessment.

The Center Evaluation Plan (Appendix A) provides a guide to evaluation activities for programs wishing to replicate. This plan is geared toward providing information for the operation of the program and is seen as an integral part of the operation of the Center. In addition, the Center has prepared a paper "We Do - They Do: A Model for Practical Service Program Evaluation" that outlines a more general evaluation model based on the Center Evaluation Plan. This paper was presented at the EVALUATION '86 conference and is

available on request. These materials provide information on how to organize and conduct evaluation of a program like the Center that can be utilized by those wishing to replicate the Center.

Third year replication activities in this area will involve completion of a formal paper related to the WE DO -THEY DO Model, dissemination of evaluation results, and completion of an evaluation packet covering the Centers Evaluation Plan. The evaluation packet will be included with other replication information requests.

B. Products and Product Development

Program products include replication materials, formal reports and papers, and informal reports, working papers, and technical reports. This section will detail existing and to - be - developed products in these areas.

1. Replication Materials

Development of formal replication materials will be undertaken during the third year. The products indicated in the previous section will constitute the major replication products produced by the Center. In summary these products will be:

1. An equipment and software resource book specifically addressing the college and business environment.
2. An assessment manual.
3. An intervention manual.
4. An evaluation packet.

These products will be combined with an administrative/ organizational packet to produce a Replication Booklet. This booklet will contain the basic how-to information needed to replicate the Center and Center activities.

2. Formal Reports and Papers

Formal reports and papers are products that contribute to the general body of scientific knowledge and practice in the disability services and educational fields. These products are primarily in the form of published articles in the professional literature. Published articles to-date are:

1. Horn, C., Shell, D. F., & Severs, M. (1985). Microcomputers and the Disabled College Students. In Proceedings of the MRADE/WCRLA conference. Available from Western College and Learning Association, Kearney State College, Kearney, NE.

2. Horn, C., Shell, D. F., & Severs, M. (1986). Survival skills for disabled college students: Computer technology and cognitive skills training. In Proceedings: The ninth national conference of the Association on Handicapped Student Service Programs in Post-Secondary Education, AHSSPPE '86. Available from AHSSPPE, Columbus, OH.

3. Horn, C., Shell, D. F., & Severs, M. (1987). The educational center for disabled students: An integrated technology and cognitive skills program for disabled college students. 1986 Closing the Gap Conference Procedings. Available from Closing the Gap, Henderson, MN.

Third-year activities in this area will consist of the continuing development of formal papers concerning aspects of the program as data are obtained. Anticipated topics for third year papers include:

1. Assessment methods and the IPO Model.

2. Center intervention strategies.

3. Evaluation procedures.

4. Evaluation outcome data.

5. Technology in the classroom.

6. Mainstreaming and the disabled college student.

These papers will be prepared in conjunction with work on the replication manuals.

3. Informal Reports, Working Papers and Technical Reports

Informal reports, papers and technical reports are the methods for reporting ongoing project developments and findings. This class of product includes papers presented at professional conferences, mid-year and final evaluation reports, drafts of papers in progress, and program instruments. These type of materials represent the initial work leading to replication materials or formal papers.

Informal reports and working papers currently available include:

1. Shell, D. F., Horn, C., & Severs, M. (1986). We do-they do: A model for practical service program evaluation. Paper presented at EVALUATION '86, Kansas City, MO.

2. Severs, M. (1987). Computer technology for enhancing disabled student writing: Applications and Limitations. Paper presented at Conference on College Composition and Communication, Atlanta, GA.

3. Shell, D. F., Horn, C. A., & Severs, M. K. (1987). Effects of a computer based educational center on disabled students' academic performance. (In press, Journal of College Student Development).

4. 1985-86 Mid-Year Evaluation Report.

5. 1985-86 Final Report.

6. 1986-87 Mid-Year Evaluation Report.

7. Needs Assessment Instrument and instruction letter.

8. Equipment inventory and vendor listing.

These products are available upon request.

During the third year working papers and reports will continue to be made available as produced. Periodic announcements of available materials will be provided in the Center newsletter.

VI. SUMMARY AND CONCLUSIONS

Summary

This report has detailed second year activities and evaluation results for the Educational Center for Disabled Students at the University of Nebraska-Lincoln. Second year activities have focused on summative outcome evaluation of Center activities in accordance with the Center Evaluation Plan. Additional second year activities have involved dissemination activities through presentation at professional conferences and the publication of formal papers.

Major second year activities have been:

1. Implementation of Center services in accordance with Center objectives and expansion of service to new students.

2. Completion of initial summative outcome evaluation.

3. Expansion of dissemination activities.

4. Initial formalization of intervention and assessment procedures for replication.

Completion of these activities has allowed the Center to meet the goals and objectives set forth in the evaluation plan for second year activities.

Major findings of the first summative evaluation are as follows:

1. Student GPA has increased during the time the Center has operated and students entering since the start of the Center have a higher GPA than students prior to the Center.

2. Incidents of disabled students on academic suspension or probation have decreased over the time the Center has operated and levels of academic problems are now consistent with the general student population.

3. A higher percentage of students entering since the Center began are completing 100% of attempted credit hours than did students prior to the start of the Center.

4. Hours of Center use was a significant predictor of semester GPA.

These results indicate that the Center is having a positive effect on the students utilizing its services.

Major second year dissemination activities included six professional conference presentations and one publication. These activities along with publication of the Center Newsletter Outreach have allowed other professionals, students, parents, and academic institutions to receive valuable information about technology and the uses of technology identified through Center activities. A cooperative project with IBM Corporation to produce a brochure on the Center for distribution to IBM affiliate business and their University contact network has provided further disseminate information about Center activities.

During the second year the Center has been successful in meeting its goals and objectives. Second year activities have established the basic operational methods of the Center for student needs assessment and treatment intervention using technology and educational skills. Initial evaluation results demonstrate that established interventions are effective. Dissemination activities have begun the process of replication. These second year accomplishments have progressed the Center to a point where third year goals and activities can be focused on more detailed evaluation and the production of replication materials.

Conclusions

Conclusions from second year activities and evaluation results support and expand first year conclusions. First, a technological based educational Center can be effectively developed. Center staff have identified equipment, software, and other skill training materials that can be used to assist disabled college students in the pursuit of their educational objectives. Formalization of Center interventions throughout the second year have established the base for replication of these interventions by other post-secondary institutions.

The second conclusion, derived from evaluation results, is that the establishment of a technological center can have a significant positive effect on the academic performance of disabled students. Improvements identified in GPA and credit hours passed, and the decrease in students with academic problems, indicate that the Center contributes to the success of disabled students in the academic setting. This information is important proof of the viability and effectiveness of a technology based program.

The final conclusion reach by Center staff is that implementation of technology based services must be closely tied to specific evaluation processes and objectives. It is imperative that both process and outcome data be gathered if technology is to be effective in enhancing the educational opportunities of disabled students. Sharing of information and replication must be done by programs working in this area if an effective technology based service is to be provided.

Information on the definition of what services are provided, identification of how technology should be used and identification of other training that must be implemented to augment the technology can only be obtained from good evaluation methodology and practice so that results of these activities can be known and replicated.

VII. THIRD YEAR ACTIVITIES AND TIMELINES

Third year activities have been organized by the objectives specified in the Center Evaluation Plan. Appendix C provides the implementation schedule for activities related to each objective. The activity schedule remains basically unchanged from the second year as objective implementation has proceeded in a satisfactory manner. This section will highlight major proposed third year activities and goals.

Third year activities will primarily involve work toward development of replication information. Second year activities have resulted in more complete formalization of Center assessment and intervention techniques, dissemination of basic information, and the gathering of outcome evaluation data on the effectiveness of the Center. This information provides the base for the development of a formal replication model. The third year will be directed at obtaining more detailed evaluation information and completion of replication materials.

Major third year activities have been discussed throughout the narrative activities report. Summarized by Program Goal, these will be as follows:

A. Goal 1: Improve Student Academic Performance and Attitudes Toward School.

   1. Development of a formal assessment methodology based on the Center's IPO Model for assessing the educational and technological needs of disabled students.

   2. Component evaluation of Center technological, skill training and adaptive interventions to further define intervention methodology.

B. Goal 2: Establish Educational Center for Disabled Students.

   1. Development of resource materials for technology, software and vendors concerning available materials for post-secondary applications.

   2. Expanded program evaluation focussing on more detailed information gathering through expanded student logs and staff logs.

C. Goal 3: Disseminate Model Project Information.

   1. Targeting of presentations to yet-to-be reached audiences.

2. Focussing presentations and papers on replication oriented materials.

3. Development of formal papers covering Center assessment techniques, intervention methodology, and evaluation results.

4. Increasing business community dissemination activities to provide information on technology and aid in student transition to the workplace.

5. Development of a replication booklet containing technology resources, an assessment manual, an intervention manual, and evaluation materials.

These activities are directed primarily at dissemination and replication and the data gathering needed to formalize Center activities for replication. The goal of third year activities is to produce a workable, empirically verified model for the implementation of a technology based educational center for disabled students at the post-secondary level.

While the focus of the third year will be on replication activities, continued monitoring and reporting will be done as specified in the Center Evaluation Plan. These process and development related activities will insure that Center services to students and other activities are completed as specified. Scheduled mid-year and final reports to OSERS will be produced on these evaluation activities.

Timelines for major activities and reports are presented in the following table.

Third Year Activity Summary

Activity	Timeline	Report Date
Evaluation Plan Update (Objective 2.51)	August-September	10/15/87
Evaluation of Educational Progress (Objective 1.5)	January-February	3/01/88
Evaluation of Student Writing (Objective 1.6)	May-June	7/31/88
Evaluation of Student Attitudes (Objective 1.7)	January-February	3/01/88
Population Needs Assessment (Objectives 2.11, 2.12)	August-September January-February	10/15/87 3/01/88

Adjunctive Services Review (Objective 2.41)	August-November	12/01/87
Evaluation Plan Reports (Objective 2.52)	January-February June-July	3/01/88 7/31/88
Progress Reports		
Mid-Year	January-February	3/01/88
Final	June-July	7/31/88
Completion of Replication Material	January-June	7/31/88

Educational Center for Disabled Students Evaluation Plan
Formative Evaluation

Program Goals and Objectives		Evaluation Objectives
1.0	Goal: Improve Student Academic Performance and Attitudes.	
1.1	Evaluate student needs for adaptive hardware/software and skill training in academic areas.	Evaluation completed for each student.
1.2	Provide training in adaptive hardware/software for areas identified in evaluation.	Adaptive hardware/software training completed on schedule.
1.3	Provide training in academic skill areas identified in evaluation.	Academic skill training completed on schedule.
1.4	Evaluate student progress in use of adaptive hardware/ software and development of academic skills.	Progress evaluations completed on schedule.
1.5	Evaluate educational progress of students in the program.	Summative evaluation of academic progress completed on schedule.
1.6	Evaluate progress in student writing resulting from use of adaptive hardware/ software.	Summative evaluation of writing progress completed on schedule.
1.7	Evaluate student attitudes toward school and perceptions of ability to perform school related tasks.	Summative evaluation of attitudes and perceptions completed on schedule.

Program Goals and Objectives	Evaluation Objectives
2.0 Goal: Establish Educational Center for Disabled Students.	
2.11 Conduct adaptive hardware/ software needs assessment for student population in program.	Adaptive hardware/software needs assessment completed each semester.
2.12 Conduct educational needs assessment for student population in program.	Educational needs assessment completed each semester.
2.21 Conduct assessment of available adaptive hardware and software for meeting needs identified in needs assessment.	Adaptive hardware/software availability assessment completed each semester.
2.22 Conduct assessment of available educational software for meeting needs identified in needs assessment.	Educational software availability assessment completed each semester.
2.31 Obtain adaptive hardware and software to meet identified needs.	Complete acquisition of hardware and software each semester.
2.32 Obtain educational software to meet identified needs.	Complete acquisition of educational software each semester.
2.41 Conduct survey of adjunctive services available at the University of Nebraska and in the community.	Adjunctive services survey completed annually.
2.42 Arrange cooperative agreements between center and identified adjunctive service organizations.	Cooperative agreements completed annually.
2.51 Develop evaluation plan for center activities.	Evaluation plan completed and updated annually.
2.52 Evaluate center and center activities.	Evaluation completed in accordance with annual evaluation plan.
2.6 Obtain additional funding for the center.	Additional funding sources obtained.

Program Goals and Objectives		Evaluation Objectives
3.0	Goal: Disseminate Model Project Information.	
3.1	Publish newsletter on center activities.	Newsletter published on schedule.
3.2	Compile dissemination materials on center and center activities for publication and presentation.	Dissemination materials completed semi-annually.
3.3	Provide information on adaptive hardware/software and training to education and service professionals.	Complete workshops, training sessions, and publications for service and education personnel.
3.4	Provide information about the center to prospective students and parents.	Complete publications and presentations for prospective students and their parents.
3.5	Educate the business community concerning adaptive hardware/software for the workplace.	Complete publications and presentations for business organizations.
3.6	Provide internship opportunities at the center for students interested in disability and rehabilitation issues.	Complete placement of interns with the center.
3.7	Conduct testing of prototype adaptive hardware/software.	Prototype hardware/ software obtained and tested.

Evaluation Plan
Summary Report

1.0 Goal: Improve Student Academic Performance and Attitudes.

	Program Objective	Status	Product or Comment
1.1	Evaluate student needs for adaptive hardware/software training in academic areas.	1	Evaluations completed for all Center students. Need Assessment Instruments and methods available.
1.2	Provide training in adaptive hardware/software for areas identified in evaluation.	3	Individual training in equipment and programs in progress. Technological and Adaptive Intervention descriptions available.
1.3	Provide training in academic skill areas identified in evaluation.	3	Individual skill training instruction in progress. Cognitive skills training being tested. Skill Training Intervention descriptions available.
1.4	Evaluate student progress in use of adaptive hardware/software and development of academic skills.	3	Use logs for time on equipment and software implemented. Initial use evaluation completed.
1.5	Evaluate educational progress of students in the program.	1	Initial evaluation completed, March, 1987. Report Available.
1.6	Evaluate progress in student writing resulting from use of adaptive hardware/software.	6	Writing evaluation could not be completed. Activity suspended.
1.7	Evaluate student attitudes toward school and perceptions of ability to perform school related tasks.	1	Follow-up survey and evaluation report completed for initial population March, 1987. Survey of new students completed. Report available.

Status Codes

1 = Completed as planned
2 = Completed - deviated from plan
3 = In progress - satisfactory
4 = In progress - unsatisfactory
5 = Initiation deferred
6 = Activity abandoned
7 = Not scheduled this period

2.0 Goal: Establish Educational Center for Disabled Students.

Program Objective		Status	Product or Comment
2.11	Conduct adaptive hardware/ software needs assessment for student population in program.	1	Population demographics and needs summary completed. Report available.
2.12	Conduct educational needs assessment for student population in program.	1	Educational needs summary complete. Report available.
2.21	Conduct assessment of available adaptive hardware and software for meeting needs identified in needs assessment.	1	Assessment complete. Source Bibliography and vendor list available.
2.22	Conduct assessment of available educational software for meeting needs identified in needs assessment.	1	Assessment complete. Source Bibliography and vendor list available.
2.31	Obtain adaptive hardware and software to meet identified needs.	3	Software upgrades and new adaptive devices obtained. Equipment procurement from manufacturers in negotiation. Equipment/software inventory Available.
2.32	Obtain educational software to meet identified needs.	3	Typing, study skill, and general knowledge software obtained. Cognitive skill materials being tested. Inventory available.
2.41	Conduct survey of adjunctive services available at the University of Nebraska and in the community.	1	Survey completed for 1986-87. Survey Report available.
2.42	Arrange cooperative agreements between Center and identified adjunctive service organizations.	1	Cooperative agreements completed with University and Local/State agencies. in progress.
2.51	Develop evaluation plan for Center activities.	1	1986-87 Evaluation Plan update completed. Plan available.

Program Objective	Status	Product or Comment
2.52 Evaluate Center and Center activities.	1	First year summative evaluation completed. Evaluation Report available.
2.6 Obtain additional funding for the Center.	3	Negotiation in progress with manufacturers for equipment grants.

Status Codes

1 = Completed as planned
2 = Completed -deviated from plan
3 = In progress - satisfactory
4 = In progress - unsatisfactory
5 = Initiation deferred
6 = Activity abandoned
7 = Not scheduled this period

3.0 Goal: Disseminate Model Project Information.

	Program Objective	Status	Product or Comment
3.1	Publish newsletter on Center activities.	6	Second year newsletters completed. Replaced by AHSSPPE SIG newsletter.
3.2	Compile dissemination materials on Center and Center activities for publication and presentation.	3	Working papers in progress for needs assessment, interventions, and evalution data.
3.3	Provide information on adaptive hardware/software and training to education and service professionals.	3	Seven conference presentations completed to-date. Three publications to-date. Publications, conference papers, and working papers available.
3.4	Provide information about the Center to prospective students and parents.	3	Brochure complete and Newsletter disseminated on schedule. Ongoing consultation with students and parents in progress.
3.5	Educate the business community concerning adaptive hardware/ software for the work place.	3	Program brochure with IBM completed. Work with IBM Hotline for Handicapped in progress.
3.6	Provide internship opportunities at the Center for students interested in disability and rehabilitation issues.	3	Computer science intern working in Center. Disabled students placed in business internships.
3.7	Conduct testing of prototype adaptive hardware/ software.	3	Testing of portable workstation/communication system, Morse code entry, and internal speech board in progress.

Status Codes

1 = Completed as planned
2 = Completed -deviated from plan
3 = In progress - satisfactory
4 = In progress - unsatisfactory
5 = Initiation deferred
6 = Activity abandoned
7 = Not scheduled this period

EDUCATIONAL CENTER FOR DISABLED STUDENTS

OBJECTIVE IMPLEMENTATION SCHEDULE

----- Proposed timeline
_____ Implemented timeline
I Initiated
C Completed
X Scheduled Report

Goal: Improve Student Academic Performance and Attitudes

1987-1988

	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
1.1 Evaluate adaptive hardware/software and skill training needs	---	---	X			---	---	X				
1.2 Provide training in adaptive hardware/ software		---	---	---	---	---	---	---	---	---	---	---
1.3 Provide training in academic skills		---	---	---	---	---	---	---	---	---	---	---
1.4 Evaluate student progress in use of adaptive hardware/software and skills			---		---		---		---			
1.5 Evaluate student educational progress						---	---	X				
1.6 Evaluate student writing progress	[Objective Terminated]											
1.7 Evaluate student attitudes		---	---	---	---	---	X					

EDUCATIONAL CENTER FOR DISABLED STUDENTS

OBJECTIVE IMPLEMENTATION SCHEDULE

----- Proposed timeline
_____ Implemented timeline
I Initiated
C Completed
X Scheduled Report

Goal: Establish Educational Center for Disabled Students

		1987-1988 AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
2.11	Conduct adaptive hardware/software needs assessment	---	---	X			---	---	X				
2.12	Conduct educational needs assessment	---	---	X			---	---	X				
2.21	Conduct assessment of available adaptive hardware and software	---	---	---	X		---	---	---	X			
2.22	Conduct assessment of available educational software	---	---	---	X		---	---	---	X			
2.31	Obtain adaptive hardware/software	X		---	---			X	---	---	---	---	---
2.32	Obtain educational software	X		---	---			X	---	---	---	---	---
2.41	Conduct survey of adjunctive services	---	---	---	---	X							
2.42	Arrange cooperative agreements	---	---	---	---	---							
2.51	Develop Evaluation Plan	---	---	X									
2.52	Evaluate Center					---		X					--- X
2.6	Obtain additional funding	---	---	---	---	---	---	---	---	---	---	---	---

EDUCATIONAL CENTER FOR DISABLED STUDENTS

OBJECTIVE IMPLEMENTATION SCHEDULE

----- Proposed timeline
_____ Implemented timeline
T Initiated
C Completed
X Scheduled Report

Goal: Disseminate Model Project Information

	1987-1988 AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
3.1 Publish Newsletter	---	X		---	X		---	X		---	X	
3.2 Compile dissemination materials for publication and presentation			----------						----------			
3.3 Provide information and training to education and service professionals	----------											
3.4 Provide information about Center to prospective students and parents	----------											
3.5 Educate business community on workplace adaptations	----------											
3.6 Provide internship opportunities	---------					---------						
3.7 Conduct testing of prototype hardware/software			----------					----------				

EDUCATIONAL CENTER FOR DISABLED STUDENTS
SUMMATIVE EVALUATION

Program Goal 1.0 - Improve student academic performance and attitudes

Objective 1.5 - Evaluate educational progress of students in the program

EVALUATION OBJECTIVE	MEASUREMENT		DATA COLLECTION		DATA ANALYSIS	
	INSTRUMENTS	BASELINE	METHOD	SCHEDULE	DESIGN	GROUPS/MEASURES
1. Reduce drop-out rate for disabled students to levels equivalent to non-disabled student population	UNL Records	Current drop-out rates	Obtain average UNL drop-out rate and calculate drop-out rate for center students and general disabled population.	Annually - January	Between Groups Comparison	1a. General student population 1b. Center students 2a. General disabled population 2b. Center students
2. Increase percentage of disabled students admitted to the university	UNL Records	Current admission percentages	Obtain number of admissions for all students and for disabled students and calculate annual percentage	Annually - January	Pre - Post comparison	1a. Percentage previous year 1b. Percentage current year
3. Increase overall grade average for students in center	UNL Records	Current cummulative GPA for center students	Obtain GPA for each center student and compute average GPA	Annually - January	Pre - Post Comparison	1a. GPA previous year 1b. GPA current year
4. Increase semester credit hour load to levels equivalent to non-disabled student population	UNL Records	Current credit hour loads for disabled and non-disabled students	Obtain average credit hours per semester for all UNL students. Obtain credit hours per semester for each student in center and average.	Annually - January	Between Groups Comparison	1a. General student population 1b. Center students

EDUCATIONAL CENTER FOR DISABLED STUDENTS
SUMMATIVE EVALUATION

Program Goal 1.0 - Improve student academic performance and attitudes

Objective 1.7 - Evaluate student attitudes toward school and perceptions of ability to perform school related tasks

EVALUATION OBJECTIVE	MEASUREMENT		DATA COLLECTION		DATA ANALYSIS	
	INSTRUMENTS	BASELINE	METHOD	SCHEDULE	DESIGN	GROUPS/MEASURES
1. Decrease time spent on mechanics of school related tasks	Attitude survey Questionnaire	Intake survey score	Collect attitude survey questionnaires from all students in program. Compile group average for time spent in educational tasks.	Beginning of each school year - Sept.	Pre - Post Comparison (Annual)	1a. Time beginning of previous year 1b. Time beginning of current year
					Pre - Post Comparison (Initial)	2a. Time at intake 2b. Time last survey
2. Improve student self perception of academic ability	Attitude survey Questionnaire	Intake survey scores	Collect attitude survey questionnaires from all students in program. Compile group average for self perception of academic ability	Beginning of each school year - Sept.	Pre - Post Comparison (Annual)	1a. Perceptions beginning of previous year 1b. Perceptions beginning of current year
					Pre - Post Comparison (Initial)	2a. Perceptions at intake 2b. Perceptions last survey
3. Improve student attitudes toward school	Attitude survey Questionnaire	Intake survey scores	Collect attitude survey questionnaires from all students in program. Compile group average for attitudes toward school.	Beginning of each school year - Sept.	Pre - Post Comparison (Annual)	1a. Attitudes beginning of previous year 1b. Attitudes beginning of current year
					Pre - Post Comparison (Initial)	2a. Attitudes at intake 2b. Attitudes last survey

EDUCATIONAL CENTER FOR DISABLED STUDENTS
INTAKE NEEDS ASSESSMENT

Name: Sex:

Social Security No.: Date of Birth:

Assessment Date: High School GPA:

College: Major:

ACT: Eng: Math: SS: NSc: Com:

GPA at Entry: Current GPA:

DISABILITY CLASSIFICATION

Primary: Code#:
Secondary: Code#:
Other: Code#:

DISABILITY INFORMATION

PHYSICAL

Hand Usage (L,R,B,N):
Coordination:
Fatigue:

Finger Usage
Left Hand (Y,N):
Identify:
Coordination:
Fatigue:

Right Hand (Y,N):
Identify:
Coordination:
Fatigue:

Other Mobility
Arm Usage (L,R,B,N):
Coordination:
Fatigue:
Foot Usage (L,R,B,N):
Coordination:
Fatigue:
Head Mobility (Y,N):
Fatigue:
Eye Blink (Y,N):
Fatigue:

General Body Fatigue
Standing:
Sitting:

HEARING

Ability (H,M,L,N):
Aids Used
Hearing Aid (Y,N):
Lip Reading (Y,N):
Signing (Y,N):
Other:

VISION

Ability (H,M,L,N):
Aids Used
Specify:

Other Visual Problems
Specify:

SPEECH

Ability (H,M,L,N):
Aids Used:

LEARNING DISABILITY

Perceptual Problems (Y,N):
Specify:
Severity (H,M,L):

General Disability (Y,N):
Specify:
Severity (H,M,L):

Mental Fatigue (Y,N):
Max. Work Time:

Reading (Y,N):
Specify:
Severity (H,M,L):

Other Language (Y,N):
Specify:
Severity (H,M,L):

On Task Problems (Y,N):
Specify:
Max. Work Time:

EDUCATIONAL ASSESSMENT

Reading
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Writing
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Study Skills
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Typing
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):
Touch Type (Y,N):

Notetaking
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Computer Usage
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

COMPUTER SKILLS

Word Processing
PFS Write (Y,N):
Word Perfect (Y,N):
Other (Y,N):
Specify:

Spread Sheets
PFS Plan (Y,N):
Lotus (Y,N):
Other (Y,N):
Specify:

General
Autocad (Y,N):
PFS Plan (Y,N):
Other (Y,N):
Specify:
Specify:

Operations Ability
Start-Stop (Y,N):
Insert Disks (Y,N):
Operate Printer (Y,N):
Drive Assignments (Y,N):

General Operations Knowledge
Drive Assignments (Y,N):
Format/Copy (Y,N):
Boot Program (Y,N):
Save Files (Y,N):

RECOMMENDATIONS

Equipment:

Educational:

Thank you for your interest in our project at the Educational Center for Disabled Students. I am enclosing copies of our assessment instrument and the technological, adaptive and skill training interventions utilized in the Center. I hope this information can help you.

The assessment and interventions described in this material are oriented toward the specific purpose and situation of the Educational Center. Our focus is on supplying disabled students with computer technology that can facilitate their educational work. Cognitive and other skills training is used to allow the student to make better use of the technology available.

Students enter the Center through the Handicapped Services office at the University of Nebraska-Lincoln. Because eligibility is established through this office, the Center does no independent diagnosis for classification or determination of type or severity of disability. Assessment is done in the context of the services provided by the Center. Our assessment is, therefore, oriented toward establishing ability to access and use computer equipment, ability to gain information in the educational setting through reading and listening, and ability to produce written materials required for classes.

The Center's assessment and treatment are organized within an information processing model called IPO (Input - Processing -Output). The IPO Model represents a conceptual framework for organizing assessment and treatment, rather than a specific assessment or treatment methodology. Thus, the model provides a framework in which to use existing assessment techniques and to identify where new instruments or methods may be needed. Within the IPO Model questions are oriented to determining needs related to receiving information (input), organizing and storing information in memory (processing), and expressing information (output).

The input question is answered by assessing perceptual reading and listening ability to determine if information can be understood in these sensory modes. If the student is unable to read or hear due to a sensory/perceptual problem (e.g. visual impairment, dyslexia, hearing impairment), then the next step is to isolate the nature of the problem. Once isolated the problem is addressed by treatments designed either to help alleviate the problem directly or to compensate for the problem by providing alternative means of input (as in the case of the technological interventions used in the Center).

Processing problems are assessed by examining the students ability to transform, store, and organize information once it has been obtained. Again, the focus of assessment is to isolate, as much as possible, the specific type of processing

problem that exists. Once the problem is isolated, treatment is oriented toward training in alternative processing methods or alleviation of the problem.

Output problems are assessed by examining the writing and speech of the student. The question addressed is whether the person i able to express known information in a form that is understandable by another person. If difficulties in expression are identified, then assessment is continued to try to define the exact nature of the problem. Treatment, again, may be directed at alleviating the problem (e.g. speech therapy) or at providing alternative means of expression (e.g. computerized speech output or word processing/proofing software).

The concept of the Model that guides all of these assessment and treatment activities is the isolation of problems in terms of their impact on input, processing or output. Once a problem is isolated in one or more of the parts of the information processing system, further assessment is done to try to determine the specific nature of the problem and its severity. Treatment(s) are then selected based on the specific problem area, compensate for the problem or both. It is presumed that existing instruments could be organized within this framework to do much of the assessment.

Since we are not oriented toward trying to treat problems directly, we do not engage in assessment beyond identification of where our compensatory interventions might be helpful and where referral to other services might be useful. The particular Needs Assessment instrument enclosed is used to determine input needs, output needs and necessary adaptive intervention to allow computer access. The Disability Information section is used to identify alternative accessing needs related to the interventions used in the Center. The Educational Assessment section is used to determine input, processing and output needs related to the technological and skill training interventions available in the Center. The Computer Skills section is used to assess background in computer use and needed computer training.

The physical disability information is used to determine keyboard accessing ability and potential ability to use alternative assess (e.g. eye switch, head stick). Hand and finger usage can be assessed by verbal interview and by having the person type on a standard keyboard. Usage indication is for Left, Right, Both or None. Coordination and fatigue are noted by short comments.

Hearing, Vision and Speech section assess general ability level (High, Medium, Low, None) either through interview or through arranged formal testing. Comments on particular aspects of ability can be appended following the indication of level. Aids Used specifies existing helps the person is

utilizing (e.g. glasses, braille reading, lip reading, etc.).

The Learning Disability section is used to assess the existence of different types of learning disability, the severity (High, Medium, Low) and allow specification of the particulars of the problem(s). Again, the assessment is initially done by interview and may be augmented by specific arranged testing for more formal diagnosis.

The Educational Assessment section addresses the impact of disability on educational activities related to input, processing and output of information in the educational setting. For each area the performance level is assessed (High, Medium, Low, None) through self-report and, if needed, through additional formal testing (e.g. a reading diagnostics test or typing test). Particular relevant impairments are noted for each educational area (Yes, No), and short comments are used to detail the specific impact of the disability on performance.

The Needs Assessment form is supplemented by additional assessment activities. First, a writing sample is obtained from each student. This sample is analyzed for both writing mechanics and organization of information. This provides specific information on writing ability and needed writing instruction. It also provides general processing related information on the student's organizational skills and needed training in these areas. Second, ACT scores and high school transcripts are analyzed to identify areas where background knowledge may be lacking. General knowledge instruction and/or tutoring may be indicated if the student lacks the background information needed for a particular class.

I hope this letter and the enclosed materials are of use to you. If you have any further questions or any suggestions, please feel free to contact the Center. We will try to provide you with any materials and information that we have. Thank you again for your interest in the Center.

The Evaluation of E.C.D.S.

John J. Eerman Ph.D.

March 2, 1987

In the winter of 1985-86 the 26 handicaped students who were eligible to use the facilities of the program were interviewed. The results of those interviews were presented last year. One year later 20 of those students were still eligible to be inteviewed. From this group we were able to interview 16; the other four failed to show up for their interviews at least three times. Thus, the results presented here are based on those 16 students who were interviewed one year apart. The interview schedule consisted of 73 items and took approximately one hour to administer. Students were interviewed individually.

The age of these 16 students ranged from 18 to 36 with the average being 25.2. Twelve were males, and four were females. Six were paraplegic/quadraplegic, one had cerebral palsy, three were sight impaired, one was hearing-impaired, one was dyslexic, and four had other handicaps.

Areas of Program Impact

In response to a direct question about program helpfullness, 60% felt that the program had helped them in some way. The average number of times they used the program was a little more than once a week (5.1 times per month). This suggests that the program is in fact being utilized and that the students perceive it as effective.

Given the nature of the program, it makes most sense that the program would impact on time spent on written work. Thus, a key issue was a pre-post comparison of the responses to the following question, "When you are attending school, how many hours per week do you usually spend on written work?" At the pretest students reported an average of 7.4 hours per week; at the posttest they reported an average of 5 hours per week. This produced a T statistic of 1.91 with a p value of .08 which is quite close to statistical significance. Furthermore, when directly asked if the program had changed the number of hours spent per week on written work, 31% said yes.

There were several other specific areas in which students perceived that changes had occurred following program participation. Results showed that 50% felt less intimidated by computers as a result of the program; none felt more intimidated. Students also reported spending less hours per week on school work following program participation. This finding appears to come from a small group (13%) of students who were initially spending a great deal of time on their studies and who now are able to spend more reasonable amounts of time. Also, 29% of the students reported that the program brought about changes in the types of courses in which they did well.

Perhaps the most meaningful and important findings have to do with changes in students perceptions of causes of their successes and failures. First, after program

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participation students felt that their handicap was less of a factor when they had difficulties at school. That is, they tended to attribute their failures less to their handicap. Specifically, students were asked to respod on a 5-point scale from 1=never to 5=always to the question, "When you have trouble in a course, how frequently is it due to your handicap?". They responded with a mean of 3.3 before the program was initiated and a mean of 2.7 after one year with the program. This difference was statistically significant with a probability of .02.

In response to a parrallel question about factors influencing success in a course, students reported that teacher accomodation to their physical limatations was less of a factor in their success following program participation than it was before they started the program. Using the same 5-point scale described above, the mean at the pretest on the question was 3.8, and the mean on the posttest was 2.8. This was significant at the .03 level of significance. Since the program did not directly involve teachers, this result probably reflects more of a change in students' attributions than an actual change in teachers' behavior. Although none of them reached statistical significance, means of several other factors that could be responsible for students' success showed increases in attributions (e.g., hard work and natural academic ability). Thus, there was somewhat of a trend in the direction of attributing success

and failure more to internal causes and less to external factors such as teachers or their own handicap.

Students were also asked if program participation affected their level of confidence in various courses. Interestingly enough, an increase in confidence showed up as statistically significant only in the area of foreign languages. However, in no kinds of courses did confidence decrease significantly.

Areas of No Measurable Impact

The program did not apparently affect the way students distributed their time studying for courses. Specifically, students were asked how much time they devoted to such activities as reading required materials, writing and preparing papers for class, working on other written homework, and studying for tests. These remained the same after as before the program.

Students were also asked to estimate their GPA for the next semester and to estimate the chances of their completing college. Both of these showed no difference pre and post program participation. With regard to their estimates of their chances of completion, it should be noted that approximately 90% felt they would graduate before the program started; thus, there is danger that a "ceiling" effect dampened differences.

Summary

It appears that the program did have some impact. Two-thirds felt that overall it helped them; and the average usage was a little more than once a week. The program showed some evidence of reducing time spent on written work and on homework in general. As a group students felt less intimidated by computers. Also, there was some evidence that after the program, students made more internal and less external attributions of their successes and failures in academic work.

The program did not seem to impact on the students' estimates of next semester's grade point average nor on their estimates of the probability they would graduate from college. Furthermore, the program did not seem to impact on students' confidence in various kinds of courses relevant to this program.

1986-87 ADJUNCTIVE SERVICES SURVEY

University of Nebraska-Lincoln

David R. Beukelman, Head Augmentative Communication Center	Provides consulting on computer technology for the disabled.
Academic Success Center	Provides tutoring for disabled students.
Internship and Cooperative Education Office	Provides internship opportunities in business settings.
Lois Schwab, Professor of Human Development and the Family	Provides internship students through rehabilitation program.
Kay King, Associate Professor of Human Development and the Family	Provides internship students through rehabilitation program.
Office of Registration and Records	Provides assistance in registering students and ensuring accessible rooms.
Office of Admissions	Provides listings of disabled students admitted to UNL.

Other State Agencies

Meyers Childrens' Rehabilitation Institute	Makes referrals to UNL of disabled students. Exchange of information.
Nebraska Department of Vocational Rehabilitation	Provides tuition remission to disabled students and has purchased some computer systems.
Nebraska Services for the Visually Impaired	Provides assistance to visually impaired students and advice on technology available.

Other Agencies

Lincoln Public Schools	Exchange of information on computer technology for disabled students.

Omaha Public Schools	Exchange of information on computer technology for disabled students.
League of Human Dignity	Provides services for disabled students.
Nebraska Wesleyan University	Exchange of information on services for disabled students.
Madonna Rehabilitation Hospital	Provides rehabilitation therapy for physically disabled students.

COMPUTER USE LOG

COMPUTER: _____

NAME	DATE	TIME IN	TIME OUT	PROGRAM	TASK/CLASS	PERIPHERALS

TECHNOLOGICAL INTERVENTIONS

INPUT

Intervention	Equipment	Disability	Sensory or Motor Skill Transference	Description
Optical Text Scanning	IBM PC, Omni Reader	PI, HI	Physically manipulated print to screen output	Used to overcome limitations on manipulating printed material.
Optical Text Scanning Enlarged Screen	IBM PC, Omni Reader, VTEK Monitor	VI	Visual standard print to visual enlarged print	Used to access printed material that are too small to be seen.
Optical Text Scanning Voice Synthesis	IBM PC, Omni Reader, VOTRAX or DECTAlk	VI, LD	Visual print to spoken text	Used to access printed material that can not be seen or read.
Optical Text Scanning Braille Print	IBM PC, Omni Reader, Braille Printer	VI	Visual print to touch print	Used to access printed material that can not be seen.
Transcription	IBM PC or Apple IIe	HI	Spoken text to visual print	Used to access spoken material that can not be heard.
Transcription Voice Synthesis	IBM PC, VOTRAX or DECTALK	VI, LD	Visual print to spoken text	Used to access printed material that can not be seen or read.

OUTPUT

Word Processing	IBM PC, Apple IIe	All	Written script to keyboard entry	Used to allow production of written text.
Word Processing Proofing	IBM PC or Apple IIe, Proofing Software	PI, LD, HI	Written script to keyboard entry	Used to compensate for problems in writing mechanics.
Voice Communication System	IBM Convertible, VOTRAX	SI	Speaking to keyboard entry with voice output	Used to allow vocal communication.
Portable Notewriting System	IBM Convertible or TRS 80 Model 100	PI, LD, VI	Written script to keyboard entry	Used to allow production of written in class notes.
Portable Writing System	IBM Convertible, Printer	PI, LD, VI	Written script to keyboard entry	Used to allow in class writing.
Computer Assisted Design (CAD).	IBM PC, Mouse	PI	Physical drawing to keyboard or mouse entry	Used to allow drawing, drafting, etc.

ADAPTIVE INTERVENTIONS

Intervention	Device/Peripheral	Computer	Description	Purpose
Single Switch Input	Adaptive Firmware Card	Apple	Single switch input using alphabet scanning array.	Allow data entry to computer when keyboard entry not possible.
Single Switch Input	Words+ System	IBM	Single switch input using word scanning array.	Allow data entry to computer when keyboard entry not possible.
Alternative Keyboard	Unicorn Board	Apple	Word or alphabet entry using special function board.	Allow data entry to computer when keyboard entry not possible.
Morse Code Input	Words+ System	IBM	Sip/puff entry using Morse code system.	Allow data entry to computer when keyboard entry not possible.
Voice Output	VOTRAX or DECTALK Speech Synthesizers	IBM	Speech output of computer screen contents and typed commands.	Allow access to computer and screen output when reading screen not possible.
Enlarged Screen	VTEK Monitor	IBM	Screen contents displayed in large typeface.	Allow access to screen output when viewing normal screen not possible.
Braille Print	Braille Printer	IBM or Apple	Program and screen contents printed in braille.	Allow access to screen and program output when viewing screen not possible.
Guarded Keyboard	Keyguard	IBM	Keyguard placed over standard keyboard.	Eliminate drag across keys and allow locking of special purpose keys.
Altered Keyboard	ProKey Program	IBM	Keys reprogramed to enter commands or character strings.	Allow single keystroke entry of commands or special functions.
Abbreviated Input	ProKey Program or Productivity Plus Program	IBM	Macro's written to enter phrases with reduced keystrokes.	Allow entry of phrases or words with fewer keystrokes.
Supported Keyboard	Supports for arm/wrist	IBM or Apple	Supporting devices attached to keyboard.	Provide relief from fatigue in accessing keyboard and/or stabilize arm for control of keystrokes.

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SKILL TRAINING/PROCESSING INTERVENTIONS

Intervention	Software/Training Materials	Description	Purpose
Typing Instruction	Typing Tutor	Training in keyboard skills.	Allow data entry on computer.
Writing Mechanics Instruction	Pro Sentence Pro Grammar	Training in writing component skills.	Improve readability of written work.
Writing Organization Instruction	Cognitive Skills	Training in writing content organization.	Improve organization and content of written work.
Writing Organization Instruction	Proteus HBJ Writer	Writing content organization practice.	Allow refinement of writing organizational skills.
Study Skills	Study Skills Program	Training in library skills and paper writing.	Improve use of library and paper writing techniques.
General Knowledge Instruction	Knowledge Master Program	Training in vocabulary and general knowledge.	Enhance background knowledge and vocabulary in basic subject fields.
Language Comprehension Instruction	Cognitive Skills	Training in reading and verbal comprehension.	Improve reading and lecture comprehension and memory for class material.

INITIAL POPULATION PROFILE

OCTOBER 1985

DISABLING CONDITION	UNL	PROJECT
Total Disabled Students	55	25
Visually Impaired	10	5
Acoustically Impaired	7	2
Brain Trauma	2	1
Learning Disabled	5*	3
Quadriplegic	11	8
Cerebal Palsy	5	3
Muscular Dystrophy	1	-
Muscular Atrophy	1	-
Multiple Sclerosis	1	-
Arthritis	1	1
Spinal Bifida	1	-
Other	10	2

* This number does not represent all Learning Disabled Students at UNL.

STUDENT UTILIZATION OF THE CENTER

JANUARY 1986

DISABILITY	APPLICATIONS	USAGE		
		COMPUTER	ACADEMIC	BOTH
Quadriplegic	8	2	2	4
Orthopedic	5	1	-	2
Visually Impaired	7	3	2	1
Learning Disabled	6	3	-	4
Hearing Impaired	4	-	2	1
Head Trauma	2	1	-	1
Cerebal Palsy	3	1	-	2
Arthritis	1	-	-	1
TOTAL	36	16	6	11

STUDENT UTILIZATION OF THE CENTER

JUNE 1986

DISABILITY	APPLICATIONS	USAGE		
		COMPUTER	ACADEMIC	BOTH
Quadriplegic	9	2	3	4
Orthopedic	6	2	-	2
Visually Impaired	8	3	3	1
Learning Disabled	10	3	-	7
Hearing Impaired	5	1	2	1
Head Trauma	2	1	-	1
Cerebral Palsy	4	1	-	3
Arthritis	1	-	-	1
Multiple Sclerosis	1	-	-	1
Multiply Handicapped	1	-	1	-
TOTAL	47	13	9	21

STUDENT UTILIZATION OF THE CENTER

JANUARY 1987

DISABILITY	USAGE		
	COMPUTER	ACADEMIC	BOTH
Quadriplegic	12	1	1
Paraplegic	1	-	-
Orthopedic	3	-	4
Visually Impaired	2	1	5
Learning Disabled	1	-	9
Hearing Impaired	2	1	4
Head Trauma	1	-	1
Cerebral Palsy	-	-	5
Arthritis	3	-	-
Multiple Sclerosis	1	-	1
Multiply Handicapped	3	-	-
Amputee	3	-	-
TOTAL	32	3	30

SUMMARY OF STUDENT TECHNOLOGICAL AND EDUCATIONAL NEEDS

Intervention	Number of Students
Technological Interventions	
Input	
Optical Text Scanning	4
Optical Text Scanning/Enlarged Screen	14
Optical Text Scanning/Voice Synthesis	10
Optical Text Scanning/Braille Print	1
Transcription	1
Transcription/Voice Synthesis	0
Output	
Word Processing	21
Word Processing/Proofing	33
Voice Communication System	1
Portable Notewriting System	24
Portable Writing System	2
Computer Assisted Design (CAD)	3
Skill Training/Processing Interventions	
Typing Instruction	13
Writing Mechanics Instruction	14
Writing Organization Instruction	27
Study Skills	22
General Knowledge Instruction	15
Language Comprehension Instruction	9
Adaptive Interventions	
Single Switch Input/Adaptive Firmware Card	2
Single Switch Input/Words+ System	2
Alternative Keyboard	1
Morse Code Input	4
Voice Output	4
Enlarged Screen	9
Braille Print	2
Guarded Keyboard	2
Altered Keyboard	6
Abbreviated Input	11
Supported Keyboard	0
Hard Drive	2

BIBLIOGRAPHY OF SOURCES FOR INFORMATION ON
TECHNOLOGICAL ADAPTATIONS FOR THE DISABLED

Publications

Closing The Gap: Computer Technology for Special Education and Rehabilitation, (Bi-Monthly Magazine). Dolores Hagen, Box 68, Henderson, MN 56044

Computer Technology for the Handicapped: Proceedings of the Closing The Gap Conference, (Annual: 84, 85, 86). Michael Gergen (and others), Closing The Gap, Box 68, Henderson, MN 56044.

International Software/Hardware Registry, 2nd Edition (1984). Gregg Vanderheiden, Dale Bengston, Mary Brady, Lottie Walstead (Eds.), Trace Research and Development Center on Communication, Control, and Computer Access for Handicapped Individuals, University of Wisconsin-Madison, 314 Waisman Center, 1500 Highland Avenue, Madison, Wisconsin 53706.

Microcomputer Resource Book for Special Education (1984). Dolores Hagen, Closing The Gap, Box 68, Henderson MN 56044.

Personal Computers and the Disabled (1984). Peter McWilliams, Closing The Gap, Box 68, Henderson MN 56044.

The Book of Apple Software, 6th Edition (1985). Jeffrey Stanton, Mia McCroskey & Michael Mellin (Eds.), Arrays, Inc., 6711 Valjean Avenue, Van Nuys, CA 91406.

The Book of IBM Software, 3rd Edition (1986). Mia McCroskey & Michael Mellin (Eds.), Arrays, Inc., 6711 Valjean Avenue, Van Nuys, CA 91406.

General Information Sources

Augmentative Communication Center, 318H Barkley Memorial Center, University of Nebraska-Lincoln, 68588-0739 (David Beukelman).

Center for Special Education Technology, Council for Exceptional Children, 1920 Association Dr., Reston, VA 22091.

Closing The Gap, Box 68, Henderson, MN 56044.

IBM Educational Systems, 411 Northside Parkway, Atlanta, GA 30327 (Walter Dean).

Trace Research and Development Center on Communication, Control, and Computer Access for Handicapped Individuals, University of Wisconsin-Madison, 314 Waisman Center, 1500 Highland Avenue, Madison, Wisconsin 53706.

E.C.D.S. EQUIPMENT INVENTORY

Computers

Quantity	Model	Configuration
3	Apple IIe	128K / Monitor
2	IBM PC	256K / Monitor / 2 Disk Drives
5	IBM PC Portable	256K / Monitor / 2 Disk Drives
1	IBM PC XT	640K / Monitor / 2 Disk Drives / Hard Disk
1	Words+ Living Center	640K / Monitor / 2 Disk Drives / Hard Disk
1	NCR First Step	64K / Monitor / 2 Disk Drives

Lap Top Computers

Quantity	Model	Configuration
5	TRS 80 Model 100	16K / Monitor
1	IBM PC Convertible	256K / Monitor / 1 Disk Drive

Printers

Quantity	Model	Type
4	Panasonic KX-P1091	Dot Matrix
2	Apple Imagewriter	Dot Matrix
1	Epson LX-86	Dot Matrix
1	Epson FX-85	Dot Matrix
1	IBM Graphics Printer	Dot Matrix
1	NCR First Step	Daisy Wheel
1	IBM PC Convertible Printer	Dot Matrix

Miscellaneous

Quantity	Model
1	Hayes Smartmodem 300
1	Amdec Monitor
1	Gold Star Monitor
3	Apple Disk Drives
1	Cannon 5 Star Typewriter

Adaptive Equipment

Quantity	Model
1	VTEK Large Print Display Monitor
2	VOTRAX Person Speech System Voice Synthesizer
1	DECTALK Voice Synthesizer
2	Omni-Reader Optical Character Reader
1	Mouse Systems Mouse Input Device
2	Adaptive Firmware Card
2	Unicorn Board

E.C.D.S. SOFTWARE INVENTORY

General Purpose Software

Program Name	Computer	Description
PFS Write	IBM	Word Processor / Proofreader
PFS Write	Apple	Word Processor
Word Perfect	IBM	Word Processor / Proofreader
Magic Slate	Apple	Word Processor
PFS Plan	IBM	Spreadsheet
PFS Plan	Apple	Spreadsheet
PFS File	IBM	Data Base
PFS Report	IBM	Data File Report Writer
PFS Graph	IBM	Graph Writing
PFS Graph	Apple	Graph Writing
Lotus Symphony	IBM	Integrated Spreadsheet / Word Processing / Data File
Apple Works	Apple	Integrated Word Processing / Data File
Sensible Speller	Apple	Spelling Checker
Newsroom	IBM/Apple	Clip Art/ Word Processing
Crosstalk	IBM	Communications / Modem Operation
Remote Control	IBM TRS 80	Communications / Modem Operation Data Transfer

Educational Software

Program Name	Computer	Description
Typing Tutor III	IBM	Typing Instruction
Knowledge Master	Apple	General Knowledge Instruction
Study Skills	Apple	Research / Paper Writing Instruction
Pro Sentence	Apple	Instruction in sentence writing
Pro Grammar	Apple	Grammar Usage Instruction
EZ Pilot II	IBM	Educational Course / Test Authoring Program
MPALS	IBM	Authoring / Educational Course Development Program

Special Purpose Software

Program Name	Computer	Description
Proteus	IBM/Apple	Writing Organization / Outlining
Rightwriter	IBM	Grammar / Style Diagnostics
HBJ Writer	IBM	Writing Organization / Word Processing / Style Diagnostics
AI Typist	IBM	Word Processing / Real Time Spell Checking
PC Paint	IBM	Drawing Program
AutoCad	IBM	CAD/CAM Drawing / Drafting Program

Adaptive Software

Program Name	Computer	Description
Prokey	IBM	Keyboard Alteration / Macro Writing
Productivity Plus	IBM	Abbreviated Keyboard Input / Macro Writing
Screen Talk	IBM	Screen Voice Output
Words + Living Center	IBM	Alternate Keyboard Input / Voice Output
Mouse Systems	IBM	Alternate (Mouse) Input

E.C.D.S. HARDWARE VENDOR INVENTORY

Computers

Model	Vendor
Apple IIe	Apple Computer Corporation/Local Dealer
IBM PC	IBM Corporation/Local Dealer
IBM PC XT	IBM Corporation/Local Dealer
Words+ Living Center	Words+, Inc., Sunnyvale CA
NCR First Step	National Cash Resgister Corporation/ Local Dealer

Lap Top Computers

Model	Vendor
TRS 80 Model 100	Tandy/Radio Shack Corporation/Local Dealer
IBM PC Convertible	IBM Corporation/Local Dealer

Printers

Model	Vendor
Panasonic KX-P1091	Panasonic Industrial Co., Secaucus, NJ/ Local Dealer
Apple Imagewriter	Apple Computer Corporation/Local Dealer
Epson LX-86, FX-85	Epson America, Inc. Torrance CA/Local Dealer
IBM Graphics Printer	IBM Corporation/Local Dealer
NCR First Step (NEC Spinwriter 3500R)	NCR Corporation, NEC Corporation/Local Dealer
IBM PC Convertible Printer	IBM Corporation/Local Dealer

Miscellaneous

Model	Vendor
Hayes Smartmodem 300	Hayes Microcomputer Products, INC., Norcross, GA/Local Dealer
Amdek Monitor	AMDEC Corporation/Local Dealer
Gold Star Monitor	Gold Star Co., LTD./Local Dealer
Apple Disk Drives	Apple Computer Corporation/Local Dealer
Cannon 5 Star Typewriter	Canon U.S.A., INC./Local Dealer

Adaptive Equipment

Model	Vendor
VTEK Large Print Display Monitor	VTEK, Santa Monica, CA

VOTRAX Person Speech System Voice Synthesizer	Votrax, Inc., Troy, MI
DECTALK Voice Synthesizer	Digital Equipment Corporation
Omni-Reader Optical Character Reader	California Digital, Carson, CA
Mouse Systems Mouse Input Device	Mouse Systems Corporation, Santa Clara, CA/Local Dealer
Adaptive Firmware Card	Adaptive Peripherals, INC., Seattle WA.
Unicorn Board	Unicorn Engineering, Oakland, CA

E.C.D.S. SOFTWARE VENDOR INVENTORY

General Purpose Software

Program Name	Vendor
PFS Write PFS Plan PFS File PFS Graph PFS Report	Software Publishing Corp., Mountain View, CA/ Local Dealer (All PFS Products)
Word Perfect	SSI Software, Orem, UT/Local Dealer
Magic Slate	Sunburst Communications, Inc., Pleasantville, NY/Local Dealer
Lotus Symphony	Lotus Development Corp., Cambridge, MA/Local Dealer
Apple Works	Apple Computer Corporation/Local Dealer
Sensible Speller	Sensible Software, Inc., Birmingham, MI/Local Dealer
Newsroom	Springboard Software, Inc., Minneapolis, MN/ Local Dealer
Crosstalk	Microstuf, Inc., Roswell, GA/Local Dealer
Remote Control	Kensington Microware, New York, NY/Local Dealer

Educational Software

Program Name	Vendor
Typing Tutor III	Kriya Systems, Inc., (Simon & Schuster, Inc.), New York, NY/Local Dealer
Knowledge Master	Academic Hallmarks, Durango, CO
Study Skills	C.C. Publications, Inc., Tigard, OR
Pro Sentence	Southwestern Publishing Co.
Pro Grammar	Southwestern Publishing Co.
EZ Pilot II	Hartley Courseware, Inc., Dimondale, MI
MPALS	IBM Personally Developed Software, Boca Raton, FL/Local Dealer

Special Purpose Software

Program Name	Vendor
Proteus	Research Design Asso., Inc., Stony Brook, NY
Rightwriter	Decisionware, Inc., Sarasota, FL/Local Dealer
HBJ Writer	Harcourt Brace Jovanovich, Publishers, San Diago, CA.
AI Typist	AIROS Corp., Lake Oswego, OR/Local Dealer
PC Paint	Mouse Systems Corporation, Santa Clara, CA/ Local Dealer
AutoCad	Autodesk, Corp., Sausalito, CA.

Adaptive Software

Program Name	Vendor
Prokey	RoseSoft, Seattle, WA/Local Dealer
Productivity +	Productivity Software International, New York, NY/Local Dealer
Screen Talk	Computer Aids Corporation, Ft. Wayne, IN
Words + Living Center	Words+, Inc., Sunnyvale CA.
Mouse Systems	Mouse Systems Corporation, Santa Clara, CA/ Local Dealer